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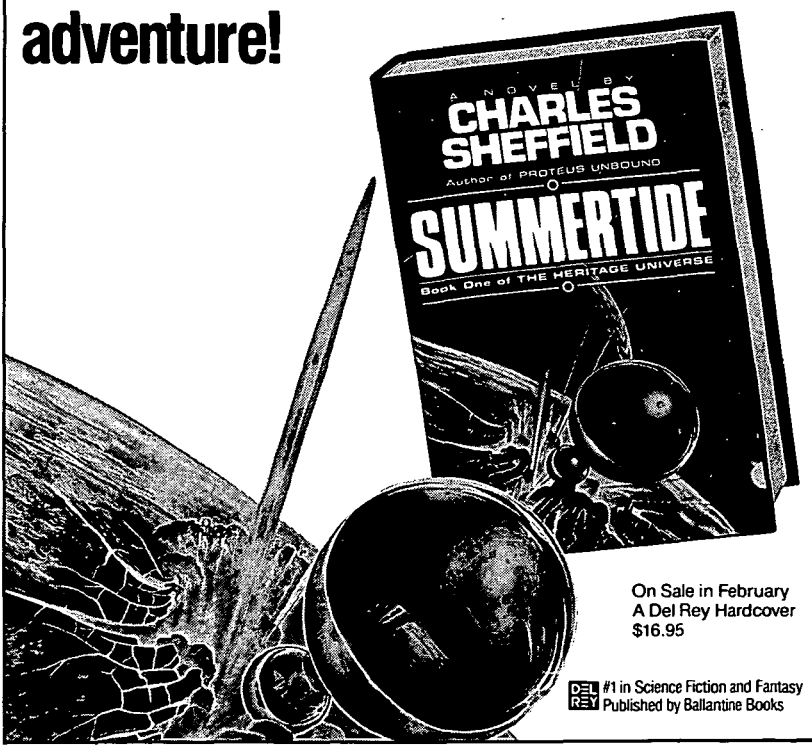

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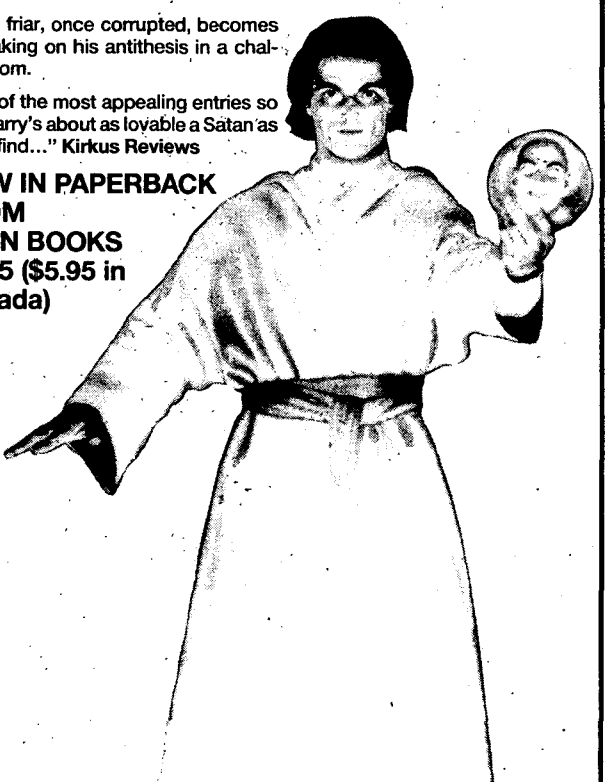

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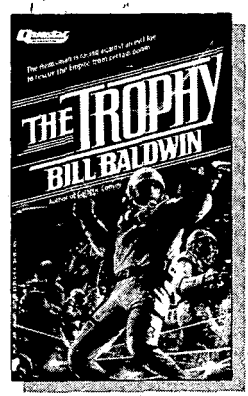

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A WORD FROM Brian Thomsen

If space is "the final frontier" (the overused cliché), then "space opera" must be "future western." Six-shooters are traded in for ray guns, one-horse towns for deserted asteroids, horses for spaceships, and Indians for aliens.

Yet it's not that simple. Science fiction can utilize all of the same symbolic devices as the western, but it also goes beyond it, and I don't think anyone is going to mistake the race for the Mitchell trophy in Bill Baldwin's THE TROPHY for an old-time sagebrush rodeo...When you see me around, now that I've finished with cowboys, ask me about pirates (and have a happy New Year).

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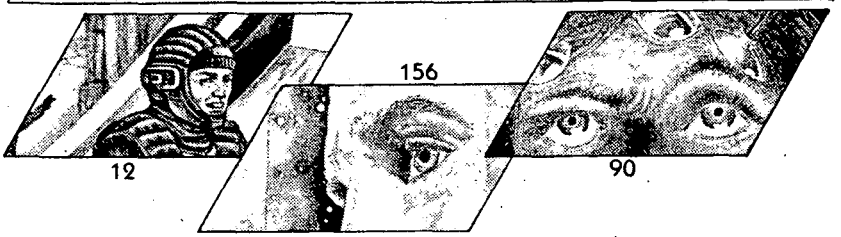

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Editorial

ON BEING HUMAN

Stanley Schmidt

Last summer I took part in a discussion about nanotechnology in which one of the participants posed a rather interesting question. The rest of us had been talking about the myriad ways in which a mature nanotechnology might change future life, a subject already familiar to many *Analog* readers from articles and stories such as Chris Peterson and K. Eric Drexler's "Nanotechnology" (Mid-December 1987) and Marc Stiegler's "The Gentle Seduction" (April 1989). Those changes include radical transformations of manufacturing and medicine, for example, that might lead to virtual immortality and unprecedented personal wealth, leisure, and capabilities—along with the potential for a variety of correspondingly unprecedented and deadly abuses.

And the gentleman in question asked, "Suppose we manage to avoid all the dangers and get all the 'benefits.' Won't that mean the end of all that it means to be human? What will people *do* when clever nanomachines do all the work of feeding us and keeping us healthy and making whatever we need?"

The question (paraphrased, since I don't have an exact transcript) deserves an attempt at a serious answer. But before you can answer it, you have to be sure you understand the question. What *does* it mean to be human?

Back in 1959, John W. Campbell had an editorial here called, "What Do You Mean . . . Human?" In it he considered the question of how to define humanity and tell when you're looking at it. For example, how would you tell an Asimovian robot how to determine whether the First Law ("Thou shalt not harm a human being . . . ") applies? Campbell proposed several "human" characteristics that might be used as

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"field marks" to recognize a human being, including the capacity for rational thought, being a living animal, bleeding when cut, having human form and size, lack of fur or hair over most of the body, and the capability for speech. He then proposed applying each of these tests to several beings: an idiot, a baby, a humanoid robot, a chimpanzee, and a man with a prosthetic arm. In each case, at least one of the tests was either inconclusive or gave an answer contrary to the one we all "know" is right. Conclusion: "human" is not a simple concept, and it's far from easy to come up with a clear and satisfactory definition.

But that's not exactly the question that was being asked with regard to nanotechnology. That one was more behavioral. Despite the difficulties Campbell pointed out in defining "human being," most of us are pretty sure we know what and who "we" *are*. But what do we *do* that makes us human?

It's probably safe to say that most of you reading this are human. It's almost equally safe to say that you have spent a sizable portion of your life as a member of a family unit including one adult of each gender and one or more of their offspring. Very likely you, or at least *somebody* in your household, works for a living. You probably understand that to mean that you spend maybe 40 hours per week performing some fairly specific kind of service for other people to earn money to pay other people for *their* services, including the production of things you need, such as food. When you're not doing that, probably everyone in your household spends at least some time in some form of play. Most of you maintain various kinds of emotional bonds to your relatives, as well as to nonrelatives with whom you've found some special affinity. You may or may not consider yourself to have a special relationship with a Supreme Being.

All of these things, and likely others which I haven't mentioned, are things you do that you probably think of as making you human, as opposed to a guppy or a geranium. But even in the present world, not all human beings do all those things, or do them in the same way, or attach the same kinds of importance to them. If you look back through history, the variations are even larger.

There was a time when "being human" meant a close attachment to a particular small region of land, and you would never have seen much more than that. To a person raised that way, the casual flitting about the globe indulged in by many modern people might have seemed suspect at least, and the notion of trying to leave the planet altogether might have seemed much too alien to fit into his or her ideas of "humanity." For that matter, in most times and places, "his" and "her" kinds of humanity were quite separate and distinct. There are plenty of people alive as I write this who are most uncomfortable with the present efforts to remove or weaken some of those distinctions. There were times (and there still are places) where "being human" meant not attachment to a particular piece of

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land, but moving constantly with the seasons and the herds. The measure of a man was how many edible animals he could kill, and the measure of a woman was how many children she could bear and raise.

There is a certain irony in the fact that the man who raised this question in the nanotechnology discussion is a television producer and director. I would love to see him try to explain that to his ancestors who were Paleolithic hunter-gatherers—and *not* just because of difficulties of explaining technology that they would see as purely and simply magic. I suspect those ancestors had quite definite ideas of their own about what it meant to be human. I think they might have been appalled to find that their descendants had no idea how to hunt aurochs, and in fact lived largely if not entirely on food provided by others.

Yes, a nanotechnology revolution, if

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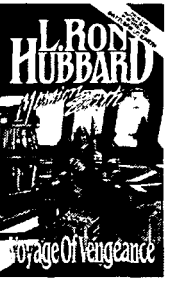

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one happens, will surely *change* our ideas of "what it means to be human." But so did the taming of fire. So did the development of agriculture, and the settling of large groups of people into farms and cities. So did the Industrial Revolution. So is the "Information Revolution" doing even now.

Yet we still consider ourselves human. So did that Paleolithic hunter-gatherer. So did the farmers and feudal lords who followed him. Every one of us has skills and values that would be alien to our ancestors and descendants, and lacks others that those ancestors considered fundamental to human nature. Yet we all consider ourselves human. So, I submit, it will be after whatever far-reaching revolutions still lie ahead of us. The woman who is the focus of "The Gentle Seduction" lives through a revolution (or series of revolutions) every bit as profound as the one that prompted the question that prompted this essay. But, far from *losing* her humanity, she uses the new capabilities to *expand* it far beyond anything she could have imagined at the story's beginning.

What will people do if advanced technology frees them from the need to spend most of their waking hours "making a living"? The question is far from new; every time new advances have led to a reduction in working hours, some people have worried about, "What will they do with their time?"

And most have gone ahead and found answers.

Oh, it's true that for some, at present, the answer consists of watching huge quantities of soap operas or ball games on television. It's fashionable to bemoan this fact, and I admit it's not what I'd want to do with *my* time—but I can't honestly maintain that what I'd choose to do with my time should determine what everybody else does with theirs. People watching soap operas aren't doing a lot to advance Human Progress, but they aren't murdering and pillaging, either. As long as they're earning their keep, how they spend their free time is their business.

Meanwhile, many people with more leisure time find a wide variety of other things to do with it, from volunteer service to travel to artistic endeavors. These may or may not be "superior" in any objective sense to watching soap operas, but they certainly represent extensions of kinds of activity that have characterized "humanness" all along.

Furthermore, not everything that people do when freed from formerly necessary labor is purely recreational. For a convenient counterexample, bear in mind that the principal effect of nanotechnology that led to this question would be to give us an unprecedented degree of control over our material surroundings. The present culture of the United States already *has* an unprecedented degree of control over its material surroundings, not matched in many other cultures in the contemporary world. Yet it also has an uncommonly high incidence of compulsive workaholic behavior! The fact that people no longer have to spend as much time as they used to on some kinds of work does not necessarily mean that they quit

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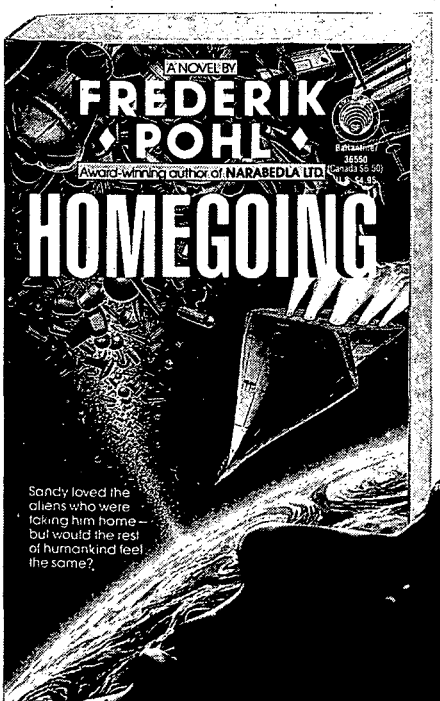
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doing any kind of work. Consider the effect the computer has had on a great many people's lives. Jobs that used to be terribly time-consuming are now quick and easy. With those disposed of quickly, the people who do them now have more time for leisure activities—or other kinds of work, including kinds they used to wish *they* could do, but which were not feasible without computer aid.

That's the kind of effect major technological revolutions have always had, and will very probably continue to have. People trying to imagine the effects of the Industrial Revolution, or the computer, tended to think in terms of how the new technology would change jobs they were already doing. They could not foresee that the really important effects would be the *elimination* of many of those jobs, and the development of completely new ones that hardly anyone had yet thought of doing at all. We are almost certainly in a similar position in our efforts to foresee the effects of revolutions yet to come.

Perhaps the most characteristically human habit of all is that we are the critters who actively transform the world we live in—and, along with it, ourselves. The essence of human nature is that we *change* human nature, faster than Nature alone can do it, and in ways that suit our own wants and needs. Future revolutions such as nanotechnology, I suspect, will not change that—though they may change nearly everything else. ■

● The fellow that can only see a week ahead is always the popular fellow, for he is looking with the crowd. But the one that can see years ahead, he has a telescope but he can't make anybody believe he has it.

Will Rogers

● A well-adjusted person is one who makes the same mistake twice without getting nervous.

Jane Heard

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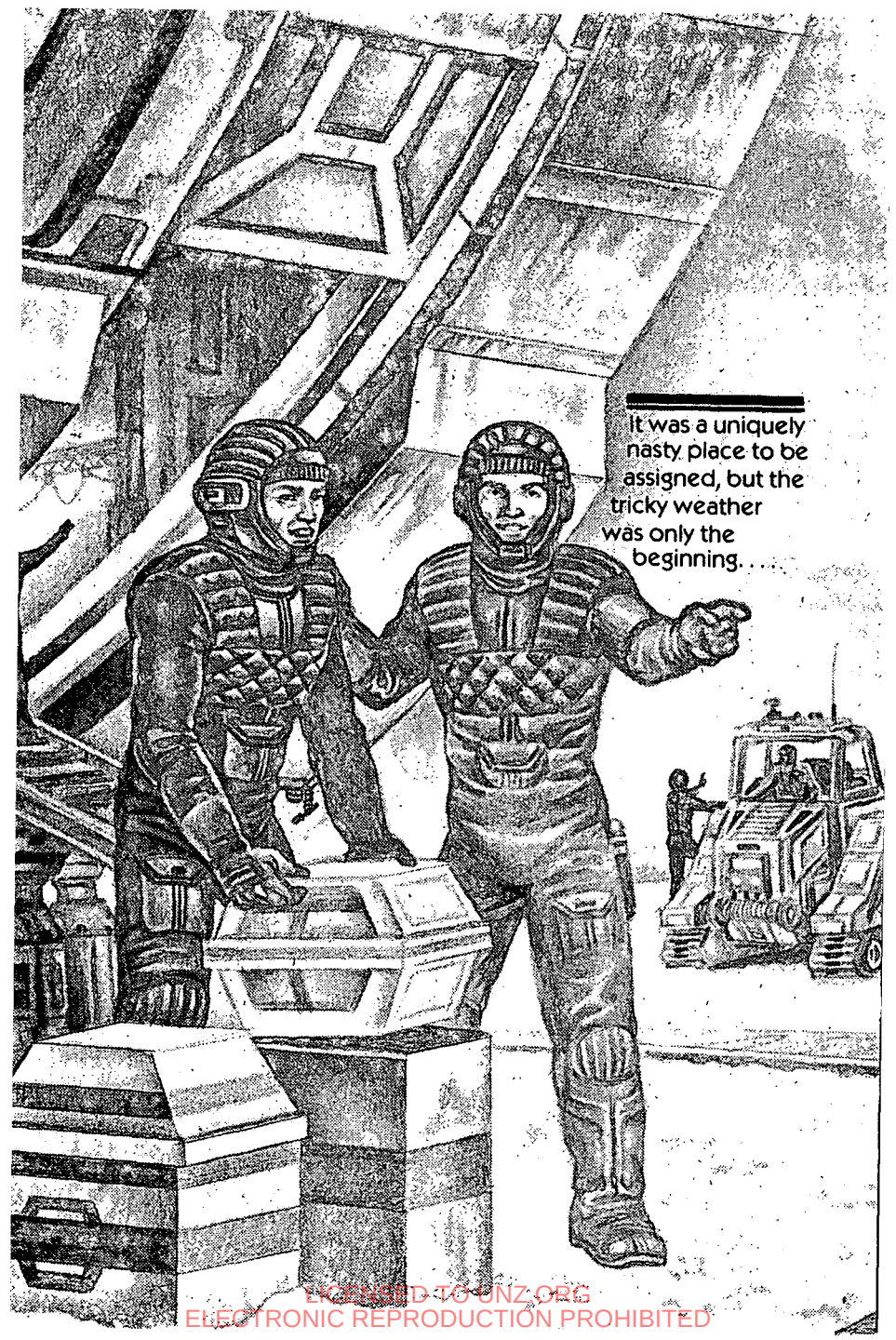

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WEATHERMAN

Lois McMaster Bujold

Dell Harris

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"Ship duty!" chortled the ensign three ahead of Miles in line. Glee lit his face as his eyes sped down his orders, the plastic flimsy rattling just slightly in his hands. "I'm to be junior weaponry officer on the Imperial Cruiser *Commodore Vorhalas*. Reporting at once to Tanery Base Shuttleport for orbital transfer." At a pointed prod he removed himself with an unmilitary skip from the way of the next man in line, still muttering delight under his breath.

"Ensign Plause." The aging sergeant manning the desk managed to look bored and superior at the same time, holding the next packet up with deliberation between thumb and forefinger. How long had he been holding down this post at the Imperial Military Academy? Miles wondered. How many hundreds— thousands —of young officers had passed under his bland eye at this first supreme moment of their careers? Did they all start to look alike after a few years? The same fresh green uniforms. The same shiny blue plastic rectangles of shiny new-won rank armoring the high collars. The same hungry eyes, the go-to-hell graduates of the Imperial Services's most elite school with visions of military destiny dancing in their heads. *We don't just march on the future, we charge it.*

Plause stepped aside, touched his thumbprint to the lock-pad, and unzipped his envelope in turn.

"Well?" said Ivan Vorpatril, just ahead of Miles in line. "Don't keep us in suspense."

"Language school," said Plause, still reading.

Plause spoke all four of Barrayar's native languages perfectly already. "As student or instructor?" Miles inquired.

"Student."

"Ah, ha. It'll be galactic languages, then. Intelligence will be wanting you, after. You're bound off-planet for sure," said Miles.

"Not necessarily," said Plause. "They could just sit me in a concrete box somewhere, programming translating computers till I go blind." But hope gleamed in his eyes.

Miles charitably did not point out the major drawback of intelligence, the fact that you ended up working for Chief of ImpSec Simon Illyan, the man who remembered *everything*. But perhaps on Plause's level, he would not encounter the acerb Illyan.

"Ensign Vorpatril," intoned the sergeant. "Ensign Vorkosigan."

Tall Ivan collected his packet and Miles his, and they moved out of the way with their two comrades.

Ivan unzipped his envelope. "Ha. Imperial HQ in Vorbarr Sultana for me. I am to be, I'll have you know, aide-de-camp to Commodore Jollif, Operations." He bowed and turned the flimsy over. "Starting tomorrow, in fact."

"Ooh," said the ensign who'd drawn ship duty, still bouncing slightly. "Ivan gets to be a *secretary*. Just watch out if General Lamitz asks you to sit on his lap, I hear he—"

Ivan flipped him an amiable rude gesture. "Envy, sheer envy. I'll get to live like a civilian. Work seven to five, have my own apartment in town—no girls on that ship of yours up there, I might point out." Ivan's voice was even and cheerful, only his eyes failing to totally con-

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ceal his disappointment. Ivan had wanted ship duty, too. They all did.

Miles did. *Ship duty. Eventually, command, like my father, his father, his, his* . . . A wish, a prayer, a dream . . . he hesitated for self-discipline, for fear, for a last lingering moment of high hope. He thumbed the lock pad and unzipped the envelope with deliberate precision. A single plastic flimsy, a handful of travel passes. . . . His deliberation lasted only for the brief moment it took him to absorb the short paragraph before his eyes. He stood frozen in disbelief, began reading again from the top.

"So what's up, coz?" Ivan glanced down over Miles's shoulder.

"Ivan," said Miles in a choked voice, "Have I got a touch of amnesia, or did we indeed never have a meteorology course on our sciences track?"

"Five-space math, yes. Xenobotany, yes." Ivan absently scratched a remembered itch. "Geology and terrain evaluation, yes. Well, there was aviation weather, back in our first year."

"Yes, but . . ."

"So what have they done to you this time?" asked Plause, clearly prepared to offer congratulations or sympathy as indicated.

"I'm assigned as Chief Meteorology Officer, Lazkowski Base. Where the hell is Lazkowski Base? I've never even heard of it!"

The sergeant at the desk looked up with a sudden evil grin. "I have, sir," he offered. "It's on a place called Kyril Island, up near the arctic circle. Winter training base for infantry. The grubs call it Camp Permafrost."

"*Infantry?*" said Miles.

Ivan's brows rose, and he frowned down at Miles. "Infantry? You? That doesn't seem right."

"No, it doesn't," said Miles faintly. Cold consciousness of his physical handicaps washed over him.

Years of arcane medical tortures had almost managed to correct the severe deformities from which Miles had nearly died at birth. Almost. Curled like a frog in infancy, he now stood almost straight. Chalk-stick bones, friable as talc, now were almost strong. Wizened as an infant homunculus, he now stood almost four-foot-nine. It had been a trade-off, toward the end, between the length of his bones and their strength, and his doctor still opined that the last six inches of height had been a mistake. Miles had finally broken his legs enough times to agree with him, but by then it was too late. But not a mutant, not . . . it scarcely mattered any more. If only they would let him place his strengths in the Emperor's service, he would make them forget his weaknesses. The deal was understood.

There had to be a thousand jobs in the Service to which his strange appearance and hidden fragility would make not one whit of difference. Like aide-de-camp, or Intelligence translator. Or even a ship's weaponry officer, monitoring his computers. It had been understood, surely it had been understood. But infantry? Someone was not playing fair. Or a mistake had been made. That wouldn't be a first. He hesitated a long moment, his fist tightening on the flimsy, then headed toward the door.

"Where are you going?" asked Ivan.

"To see Major Cecil."

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Ivan exhaled through pursed lips. "Oh? Good luck."

Did the desk sergeant hide a small smile, bending his head to sort through the next stack of packets? "Ensign Draut," he called. The line moved up one more.

Major Cecil was leaning with one hip on his clerk's desk, consulting about something on the vid, as Miles entered his office and saluted.

Major Cecil glanced up at Miles and then at his chrono. "Ah, less than ten minutes. I win the bet." The major returned Miles's salute as the clerk, smiling sourly, pulled a small wad of currency from his pocket, peeled off a one-mark note, and handed it across wordlessly to his superior. The major's face was only amused on the surface; he nodded toward the door, and the clerk tore off the plastic flimsy his machine had just produced and exited the room.

Major Cecil was a man of about fifty, lean, even-tempered, watchful. Very watchful. Though he was not the titular head of Personnel, that administrative job belonging to a higher-ranking officer, Miles had spotted Cecil long ago as the final-decision man. Through Cecil's hands passed at the last every assignment for every Academy graduate. Miles had always found him an accessible man, the teacher and scholar in him ascendant over the officer. His wit was dry and rare, his dedication to his duty intense. Miles had always trusted him. Till now.

"Sir," he began. He held out his orders in a frustrated gesture. "What *is* this?"

Cecil's eyes were still bright with his private amusement as he pocketed the mark-note. "Are you asking me to read them to you, Vorkosigan?"

"Sir, I question—" Miles stopped, bit his tongue, began again. "I have a few questions about my assignment."

"Meteorology Officer, Lazkowski Base," Major Cecil recited.

"It's . . . not a mistake, then? I got the right packet?"

"If that's what that says, you did."

"Are . . . you aware the only meteorology course I had was aviation weather?"

"I am." The major wasn't giving away a thing.

Miles paused. Cecil's sending his clerk out was a clear signal that this discussion was to be frank. "Is this some kind of punishment?" *What have I ever done to you?*

"Why, Ensign," Cecil's voice was smooth, "it's a perfectly normal assignment. My job is to match personnel requests with available candidates. Every request must be filled by someone."

"Any tech school grad could have filled this one." With an effort, Miles kept the snarl out of his voice, uncurled his fingers. "Better. It doesn't require an Academy cadet."

"That's right," agreed the major.

"*Why*, then?" Miles burst out. His voice came out louder than he'd meant it to.

Cecil sighed, straightened. "Because I have noticed, Vorkosigan, watching you—and you know very well you were the most closely-watched cadet ever to pass through these halls barring Emperor Gregor himself—"

Miles nodded shortly.

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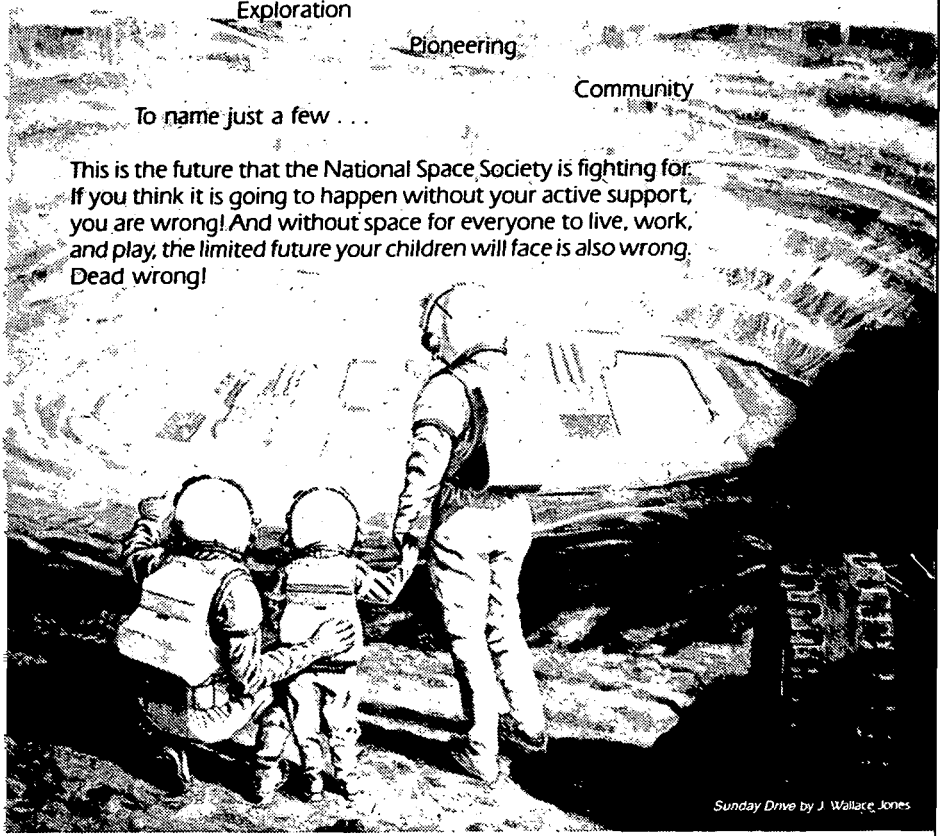

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"That despite your demonstrated brilliance in some areas, you have also demonstrated some chronic weaknesses. And I'm not referring to your physical problems, which everybody but me thought were going to take you out before your first year was up—you've been surprisingly sensible about those—"

Miles shrugged. "Pain hurts, sir. I don't court it."

"Very good. But your most insidious chronic problem is in the area of . . . how shall I put this precisely . . . subordination. You argue too much."

"No, I don't," Miles began indignantly, then shut his mouth.

Cecil flashed a grin. "Quite. Plus your rather irritating habit of treating your superior officers as your, ah . . ." Cecil paused, apparently groping again for just the right word.

"Equals?" Miles hazarded.

"Cattle," Cecil corrected judiciously. "To be driven to your will. You're a manipulator *par excellence*, Vorkosigan. I've been studying you for three years now, and your group dynamics are fascinating. Whether you were in charge or not, somehow it was always your ideas that ended up getting carried out."

"Have I been . . . that disrespectful, sir?" Miles's stomach felt cold.

"On the contrary. Given your background, the marvel is that you conceal that, ah, little arrogant streak so well. But Vorkosigan," Cecil dropped at last into perfect seriousness, "the Imperial Academy is not the whole of the Imperial Service. You've made your comrades appreciate you because here, brains are held at a premium. You were picked first for any strategic team for the same reason you were picked last for any purely physical contest—these young hot-shots wanted to win. All the time. Whatever it took."

"I can't be ordinary and survive, sir!"

Cecil tilted his head. "I agree. And yet, sometime, you must also learn how to command ordinary men. And be commanded by them!

"This isn't a punishment, Vorkosigan, and it isn't my idea of a joke. Upon my choices may depend not only our fledgling officers' lives, but also those of the innocents I inflict 'em on. If I seriously miscalculate, overmatch or mismatch a man with a job, I not only risk him, but also those around him. Now, in six months (plus unscheduled overruns), the Imperial Orbital Shipyard is going to finish commissioning the *Prince Serg*."

Miles's breath caught.

"You've got it," Cecil nodded. "The newest, fastest, deadliest thing His Imperial Majesty has ever put into space. And with the longest range. It will go out, and stay out, for longer periods than anything we've ever had before. It follows that everyone on board will be in each other's hair for longer unbroken periods than ever before. High Command is actually paying some attention to the psych profiles on this one. For a change.

"Listen, now," Cecil leaned forward. So did Miles, reflexively. "If you can keep your nose clean for just six months on an isolated downside post—bluntly, if you prove you can handle Camp Permafrost, I'll allow as how you can handle anything the Service might throw at you. And I'll sup-

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port your request for a tranfer to the *Prince*. But if you screw up, there will be nothing I or anybody else can do for you. Sink or swim, Ensign.''

Fly, thought Miles. *I want to fly*. ''Sir . . . just how much of a pit is this place?''

''I wouldn't want to prejudice you, Ensign Vorkosigan,'' said Cecil piously.

And I love you too, sir. ''But . . . infantry? My physical limits . . . won't prevent my serving if they're taken into account, but I can't pretend they're not there. Or I might as well jump off a wall, destroy myself immediately, and save everybody time.'' *Dammit, why did they let me occupy some of Barrayar's most expensive classroom space for three years if they meant to kill me outright?* ''I'd always assumed they were going to be taken into account.''

''Meteorology Officer is a technical speciality, Ensign,'' the major reassured him. ''Nobody's going to try and drop a full field pack on you and smash you flat. I doubt there's an officer in the Service who would choose to explain your dead body to the Admiral.'' His voice cooled slightly. ''Your saving grace. Mutant.''

Cecil was without prejudice, merely testing. Always testing. Miles ducked his head. ''As I may be, for the mutants who come after me.''

''You've figured that out, have you?'' Cecil's eye was suddenly speculative, faintly approving.

''Years ago, sir.''

''Hm.'' Cecil smiled slightly, pushed himself off the desk, came forward and extended his hand. ''Good luck, then, Lord Vorkosigan.''

Miles shook it. ''Thank you, sir.'' He shuffled through the stack of travel passes, ordering them.

''What's your first stop?'' asked Cecil.

Testing again. Must be a bloody reflex. Miles answered unexpectedly, ''The Academy archives.''

''Ah!''

''For a downloading of the Service meteorology manual. And supplementary material.''

''Very good. By the way, your predecessor in the post will be staying on a few weeks to complete your orientation.''

''I'm extremely glad to hear that, sir,'' said Miles sincerely.

''We're not trying to make it impossible, Ensign.''

Merely very difficult. ''I'm glad to know that, too. Sir.'' Miles's parting salute was almost subordinate.

Miles rode the last leg to Kyril Island in a big automated air-freight shuttle with a bored back-up pilot and eighty tons of supplies. He spent most of the solitary journey frantically swotting up on weather. Since the flight schedule went rapidly awry due to hours-long delays at the last two loading stops, he found himself reassuringly further along in his studies than he'd expected by the time the air-shuttle rumbled to a halt at Lazkowski Base.

The cargo bay doors opened to let in watery light from a sun skulking along near the horizon. The high-summer breeze was about five degrees above freezing. The first soldiers Miles saw were a crew of black-coveralled men with loaders under the direction of a

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tired-looking corporal, who met the shuttle. No one appeared to be specially detailed to meet a new weather officer. Miles shrugged on his parka and approached them.

A couple of the black-clad men, watching him as he hopped down from the ramp, made remarks to each other in Barrayaran Greek, a minority dialect of Earth origin, thoroughly debased in the centuries of the Time of Isolation. Miles, weary from his journey and cued by the all-too-familiar expressions on their faces, made a snap decision to ignore whatever they had to say by simply pretending not to understand their language. Plause had told him often enough that his accent in Greek was execrable anyway.

—Look at that, will you? Is it a kid?

—I knew they were sending us baby officers, but this is a new low.

—Hey, that's no kid. It's a damn dwarf of some sort. The midwife sure missed her stroke on that one. Look at it, it's a mutant!

With an effort, Miles kept his eyes from turning toward the commentators. Increasingly confident of their privacy, their voices rose from whispers to ordinary tones.

—So what's it doing in uniform, ha?

—Maybe it's our new mascot.

The old genetic fears were so subtly ingrained, so pervasive even now, you could get beaten to death by people who didn't even know quite why they hated you but simply got carried away in the excitement of a group feedback loop. Miles knew quite well he had always been protected by his father's rank, but ugly things could happen to less socially fortunate odd ones. There had been a ghastly incident in the Old Town section of Vorbarr Sultana just two years ago, a destitute crippled man found castrated with a broken wine bottle by a gang of drunks. It was considered Progress that it was a scandal, and not simply taken for granted. A recent infanticide in the Vorkosigan's own district had cut even closer to the bone. Yes, rank, social or military, had its uses. Miles meant to acquire all he could before he was done.

Miles twitched his parka back so that his officer's collar tabs showed clearly. "Hello, Corporal. I have orders to report in to a Lieutenant Ahn, the base Meteorology Officer. Where can I find him?"

Miles waited a beat for his proper salute. It was slow in coming, the corporal was still goggling down at him. It dawned on him at last that Miles might really be an officer.

Belatedly, he saluted. "Excuse me, uh, what did you say, sir?"

Miles returned the salute blandly and repeated himself in level tones.

"Uh, Lieutenant Ahn, right. He usually hides out—that is, he's usually in his office. In the main administration building." The corporal swung his arm around to point toward a two-story prefab sticking up beyond a rank of half-buried warehouses at the edge of the tarmac, maybe a kilometer off. "You can't miss it, it's the tallest building on the base."

Also, Miles noted, well-marked by the assortment of comm equipment sticking out of the roof. Very good.

Now, should he turn his pack over to these goons and pray that it would follow him to his eventual destination, whatever it was? Or interrupt their work

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and commandeer a loader for transport? He had a brief vision of himself stuck up on the prow of the thing like a sailing ship's figurehead, being trundled toward his meeting with destiny along with half a ton of Underwear, Thermal, Long, 2 doz per unit crate, Style #6774932. He decided to shoulder his duffle and walk.

"Thank you, corporal." He marched off in the indicated direction, too conscious of his limp and his leg-braces concealed beneath his trouser legs taking up their share of the extra weight. The distance turned out to be farther than it looked, but he was careful not to pause or falter till he'd turned out of sight beyond the first warehouse-unit.

The base seemed nearly deserted. Of course. The bulk of its population was the infantry trainees who came and went in two batches per winter. Only the permanent crew was here now, and Miles bet most of them took their long leaves during this brief summer breathing space. Miles wheezed to a halt inside the Admin building without having passed another man.

The Directory and Map Display, according to a hand-lettered sign taped across its vid plate, was down. Miles wandered up the first and only hallway to his right, searching for an occupied office, any occupied office. Most doors were closed, but not locked, lights out. An office labeled *Gen. Accounting* held a man in black fatigues with red lieutenant's tabs on the collar, totally absorbed in his holovid which was displaying long columns of data. He was swearing under his breath.

"Meteorology Office. Where?" Miles called in the door.

"Two." The lieutenant pointed upward without turning around, crouched more tightly, and resumed swearing. Miles tiptoed away without disturbing him further.

He found it at last on the second floor, a closed door labeled in faded letters. He paused outside, set down his duffle, and folded his parka atop it. He checked himself over. Fourteen hours' travel had rumpled his initial crispness. Still, he'd managed to keep his green undress uniform and half-boots free of foodstains, mud, and other unbecoming accretions. He flattened his cap and positioned it precisely in his belt. He'd crossed half a planet, half a lifetime, to achieve this moment. Three years training to a fever pitch of readiness lay behind him. Yet the Academy years had always had a faint air of pretense, We-are-only-practicing; now, at last, he was face to face with the real thing, his first real commanding officer. First impressions could be vital, especially in his case. He took a breath and knocked.

A gravelly muffled voice came through the door, words unrecognizable. Invitation? Miles opened it and strode in.

He had a glimpse of computer interfaces and vid displays gleaming and glowing along one wall. He rocked back at the heat that hit his face. The air within was blood-temperature. Except for the vid displays, the room was dim. At a movement to his left, Miles turned and saluted. "Ensign Miles Vorkosigan, reporting for duty as ordered, sir," he snapped out, looked up, and saw no one.

The movement had come from lower down. An unshaven man of about forty dressed only in his skivvies sat on the

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floor, his back against the comconsole desk. He smiled up at Miles, raised a bottle half-full of amber liquid, mumbled, "Salu', boy. Love ya," and fell slowly over.

Miles gazed down on him for a long, long, thoughtful moment.

The man began to snore.

After turning down the heat, shedding his tunic, and tossing a blanket over Lieutenant Ahn (for such he was), Miles took a contemplative half-hour and thoroughly examined his new domain. There was no doubt, he was going to require instruction in the office's operations. Besides the satellite real-time images, automated data seemed to be coming in from a dozen micro-climate survey rigs spotted around the island. If procedural manuals had ever existed, they weren't around now, not even on the computers. After an honorable hesitation, bemusedly studying the snoring, twitching form on the floor, Miles also took the opportunity to go through Ahn's desk and comconsole files.

Discovery of a few pertinent facts helped put the human spectacle before Miles into a more understandable perspective. Lieutenant Ahn, it seemed, was a twenty-year man within weeks of retirement. It had been a very, very long time since his last promotion. It had been an even longer time since his last transfer; he'd been Kyril Island's only weather officer for the last fifteen years.

This poor sod has been stuck on this iceberg since I was six years old, Miles calculated, and shuddered inwardly. Hard to tell, at this late date, if Ahn's drinking problem were cause or effect. Well, if he sobered up enough within the next day to show Miles how to go on, well and good. If he didn't, Miles could think of half a dozen ways, ranging from the cruel to the unusual, to bring him around whether he wanted to be conscious or not. If Ahn could just be made to disgorge a technical orientation, he could return to his coma till they came to roll him onto outgoing transport, for all Miles cared.

Ahn's fate decided, Miles donned his tunic, stowed his gear behind the desk, and went exploring. Somewhere in the chain of command there must be a conscious, sober, and sane human being who was actually doing his job, or the place couldn't even function on this level. Or maybe it was run by corporals, who knew? In that case, Miles supposed, his next task must be to find and take control of the most effective corporal available.

In the downstairs foyer a human form approached Miles, silhouetted at first against the light from the front doors. Jogging in precise double-time, the shape resolved into a tall, hard-bodied man in sweat pants, T-shirt, and running shoes. He had clearly just come in off some condition-maintaining five-kilometer run, with maybe a few hundred push-ups thrown in for dessert. Iron-grey hair, iron-hard eyes; he might have been a particularly dyspeptic drill sergeant. He stopped short to stare down at Miles, startlement compressing to a thin-lipped frown.

Miles stood with his legs slightly apart, threw back his head, and stared up with equal force. The man seemed totally oblivious to Miles's collar tabs. Exasperated, Miles snapped, "Are all

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the keepers on vacation, or is anybody actually running this bloody zoo?"

The man's eyes sparked, as if their iron had struck flint; they ignited a little warning light in Miles's brain, one mouthy moment too late. *Hi, there, sir!* cried the hysterical commenter in the back of Miles's mind, with a skip, bow, and flourish. *I'm your newest exhibit!* Miles suppressed the voice ruthlessly. There wasn't a trace of humor in any line of that seamed countenance looming over him.

With a cold flare of his carved nostril, the Base Commander glared down at Miles and growled, "*I* run it, Ensign."

Dense fog was rolling in off the distant, muttering sea by the time Miles finally found his way to his new quarters. The officers' barracks and all around it were plunged into a grey, frost-scummed obscurity. Miles decided it was an omen.

Oh, God, it was going to be a long winter.

Rather to Miles's surprise, when he arrived at Ahn's office next morning at an hour he guessed might represent beginning-of-shift, he found the lieutenant awake, sober, and in uniform. Not that the man looked precisely *well;* pasty-faced, breathing stertorously, he sat huddled staring slit-eyed at a computer-colorized weather vid. The holo zoomed and shifted dizzyingly at signals from the remote controller he clutched in one damp and trembling palm.

"Good morning, sir." Miles softened his voice out of mercy, and closed the door behind himself without slamming it.

"Ha?" Ahn looked up, and returned his salute automatically. "What the devil are you, ah . . . ensign?"

"I'm your replacement, sir. Didn't anyone tell you I was coming?"

"Oh, yes!" Ahn brightened right up. "Very good, come in." Miles, already in, smiled briefly instead. "I meant to meet you on the shuttlepad," Ahn went on. "You're early. But you seem to have found your way all right."

"I came in yesterday, sir."

"Oh. You should have reported in."

"I did, sir."

"Oh." Ahn squinted at Miles in worry. "You did?"

"You promised you'd give me a complete technical orientation to the office this morning, sir," Miles added, seizing the opportunity.

"Oh," Ahn blinked. "Good." The worried look faded slightly. "Well, ah . . ." Ahn rubbed his face, looking around. He confined his reaction to Miles's physical appearance to one covert glance, and, perhaps deciding they must have gotten the social duties of introduction out of the way yesterday, plunged at once into a description of the equipment lining the wall, in order from left to right.

Literally an introduction; all the computers had women's names. Except for a tendency to talk about his machines as though they were human, Ahn seemed coherent enough as he detailed his job, only drifting into randomness, then hung-over silence, when he accidently strayed from the topic. Miles steered him gently back to weather with pertinent questions, and took notes. After a bewildered brownian trip around the room Ahn rediscovered his office pro-

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cedural disks at last, stuck to the undersides of their respective pieces of equipment. He made fresh coffee on a non-regulation brewer—named "Georgette"—parked discreetly in a corner cupboard, then took Miles up to the roof of the building to show him the data-collection center there.

Ahn went over the assorted meters, collectors, and samplers rather perfunctorily. His headache seemed to be growing worse with the morning's exertions. He leaned heavily on the corrosion-proof railing surrounding the automated station and squinted out at the distant horizon. Miles followed him around dutifully as he appeared to meditate deeply for a few minutes on each of the cardinal compass points. Or maybe that introspective look just meant he was getting ready to throw up.

It was pale and clear this morning, the sun up—the sun had been up since two hours after midnight, Miles reminded himself. They were just past the shortest nights of the year for this latitude. From this rare high vantage point, Miles gazed out with interest at Lazkowski Base and the flat landscape beyond.

Kyril Island was an egg-shaped lump about seventy kilometers wide and a hundred and sixty kilometers long, and over five hundred kilometers from the next land of any description. *Lumpy and brown* described most of it, both base and island. The majority of the nearby buildings, including Miles's officers' barracks, were dug in, topped with native turf. Nobody had bothered with agricultural terraforming here. The island retained its original Barrayaran ecology, scarred by use and abuse. Long fat rolls of turf covered the barracks for the winter infantry trainees, now empty and silent. Muddy water-filled ruts fanned out to deserted marksmanship ranges, obstacle courses, and pocked live-ammo practice areas.

To the near south, the leaden sea heaved, muting the sun's best efforts at sparkle. To the far north a grey line marked the border of the tundra at a chain of dead volcanic mountains.

Miles had taken his own officers' short course in winter maneuvers in the Black Escarpment, mountain country deep in Barrayar's second continent; plenty of snow, to be sure, and murderous terrain, but the air had been dry and crisp and stimulating. Even today, at high summer, the sea dampness seemed to creep up under his loose parka and gnaw his bones at every old break. Miles shrugged against it, without effect.

Ahn, still draped over the railing, glanced sideways at Miles at this movement. "So tell me, ah, ensign, are you any relation to *the* Vorkosigan? I wondered, when I saw the name on the orders the other day."

"My father," said Miles shortly.

"Good God." Ahn blinked and straightened, then sagged self-consciously back onto his elbows as before. "Good God," he repeated. He chewed his lip in fascination, dulled eyes briefly alight with honest curiosity. "What's he really like?"

What an impossible question, Miles thought in exasperation. Admiral Count Aral Vorkosigan. The colossus of Barrayaran history in this half-century. Conqueror of Komarr, hero of the ghastly retreat from Escobar. For six-

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teen years Lord Regent of Barrayar during Emperor Gregor's troubled minority; the Emperor's trusted Prime Minister in the four years since. Destroyer of Vordarian's Pretendership, engineer of the peculiar victory of the third Cetagandan war, unshaken tiger-rider of Barrayar's murderous internecine politics for the past two decades. *The* Vorkosigan..

I have seen him laugh in pure delight, standing on the dock at Vorkosigan Surleau and yelling instructions over the water, the morning I first sailed, dumped, and righted the skimmer by myself. I have seen him weep till his nose ran, more dead drunk than you were yesterday, Ahn, the night we got the word Major Duvallier was executed for espionage. I have seen him rage, so brick-red we feared for his heart, when the reports came in fully detailing the stupidities that led to the last riots in Solstice. I have seen him wandering around Vorkosigan House at dawn in his underwear, yawning and prodding my sleepy mother into helping him find two matching socks. He's not like *anything, Ahn. He's the original.*

"He cares about Barrayar," Miles said aloud at last, as the silence grew awkward. "He's . . . a hard act to follow." *And, oh yes, his only child is a deformed mutant. That, too.*

"I should think so." Ahn blew out his breath in sympathy, or maybe it was nausea.

Miles decided he could tolerate Ahn's sympathy. There seemed no hint in it of the damned patronizing pity, nor, interestingly, of the more common repugnance. *It's because I'm his replacement here*, Miles decided. *I could have two heads and he'd still be overjoyed to meet me.*

"That what you're doing, following in the old man's footsteps?" said Ahn equably. And more dubiously, looking around, "Here?"

"I'm Vor," said Miles impatiently. "I serve. Or at any rate, I try to. Wherever I'm put. That was the deal."

Ahn shrugged bafflement, whether at Miles or at the vagaries of the Service that had sent him to Kyril Island Miles could not tell. "Well." He pushed himself up off the rail with a grunt. "No wah-wah warnings today.'

"No what warnings?"

Ahn yawned, and tapped an array of figures—pulled out of thin air, as far as Miles could tell—into his report panel representing hour-by-hour predictions for today's weather. "Wah-wah. Didn't anybody tell you about the wah-wah?"

"No . . ."

"They should have, first thing. Bloody dangerous, the wah-wah."

Miles began to wonder if Ahn was trying to diddle his head. Practical jokes could be a subtle enough form of victimization to penetrate even the defenses of rank, Miles had found. The honest hatred of a beating inflicted only physical pain.

Ahn leaned across the railing again to point. "You notice all those ropes, strung from door to door between buildings? That's for when the wah-wah comes up. You hang onto 'em to keep from being blown away. If you lose your grip, don't fling out your arms to try and stop yourself. I've seen more guys break their wrists that way. Go into a ball and roll."

"What the hell's a wah-wah? Sir."

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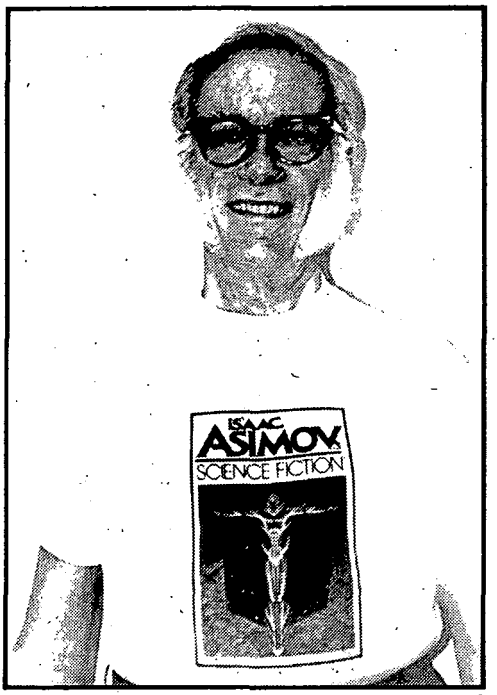

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"Big wind. Sudden. I've seen it go from dead calm to a hundred and sixty kilometers, with a temperature drop from sixteen degrees cee above freezing to thirty below, in seven minutes. It can last from ten minutes to two days. They almost always blow up from the northwest, here, when conditions are right. The remote station on the coast gives us about a twenty-minute warning. We blow a siren. That means you must never let yourself get caught without your cold gear, or less than fifteen minutes away from a bunker. There's bunkers all around the grubs' practice fields out there." Ahn waved his arm in that direction. He seemed quite serious, even earnest. "You hear that siren, you run like hell for cover. The size you are, if you ever got picked up and blown into the sea, they'd never find you again."

"All right," said Miles, silently resolving to check out these alleged facts in the base's weather records at the first opportunity. He craned his neck for a look at Ahn's report panel. "Where did you read off those numbers from, that you just entered on there?"

Ahn stared at his report panel in surprise. "Well—they're the right figures."

"I wasn't questioning their accuracy," said Miles patiently. "I want to know how you came up with them. So I can do it tomorrow, while you're still here to correct me."

Ahn waved his free hand in an abortive, frustrated gesture. "Well . . ."

"You're not just making them up, are you?" said Miles in suspicion.

"No!" said Ahn. "I hadn't thought about it, but . . . it's the way the day smells, I guess." He inhaled deeply, by way of demonstration.

Miles wrinkled his nose and sniffed experimentally. Cold, sea salt, shore slime, damp and mildew. Hot circuits in some of the blinking, twirling array of instruments beside him. The mean temperature, barometric pressure, and humidity of the present moment, let alone that of eighteen hours into the future, was not to be found in the olfactory information pressing on *his* nostrils. He jerked his thumb at the meteorological array. "Does that thing have any sort of a smell-o-meter to duplicate whatever it is you're doing?"

Ahn looked genuinely nonplussed, as if his internal system, whatever it was, had been dislocated by his sudden self-consciousness of it. "Sorry, Ensign Vorkosigan. We have the standard computerized projections, of course, but to tell you the truth I haven't used 'em in years. They're not accurate enough."

Miles stared at Ahn, and came to a horrid realization. Ahn wasn't lying, joking, or making this up. It was the fifteen years' experience, gone subliminal, that was carrying out these subtle functions. A backlog of experience Miles could not duplicate. *Nor would I wish to,* he admitted to himself.

Later in the day, while explaining with perfect truth that he was orienting himself to the systems, Miles covertly checked out all of Ahn's startling assertions in the base meteorological archives. Ahn hadn't been kidding about the wah-wah. Worse, he hadn't been kidding about the computerized projections. The automated system produced local predictions of 86% accuracy, dropping to 73% at a week's long-range

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forecast. Ahn and his magical nose ran an accuracy of 96%, dropping to 94% at a week's range. *When Ahn leaves, this island is going to experience a 10 to 21% drop in forecast accuracy. They're going to notice.*

Weather Officer, Lazkowski Base, was clearly a more responsible position than Miles had at first realized. The weather here could be deadly.

And this guy is going to leave me alone on this island with six thousand armed men, and tell me to go sniff for wah-wahs?

On the fifth day, when Miles had just about decided that his first impression had been too harsh, Ahn relapsed. Miles waited an hour for Ahn and his nose to show up at the weather office to begin the day's duties. At last he pulled the routine readings from the substandard computerized system, entered them anyway, and went hunting.

He ran Ahn down at last still in his bunk, in his quarters in the officers' barracks, sodden and snoring, stinking of stale . . . fruit brandy? Miles shuddered. Shaking, prodding, and yelling in Ahn's ear failed to rouse him. He only burrowed deeper into his bedclothes and noxious miasma, moaning. Miles regretfully set aside visions of violence, and prepared to carry on by himself. He'd be on his own soon enough anyway.

He limp-marched off to the motor pool. Yesterday Ahn had taken him on a scheduled maintenance patrol of the five remote-sensor weather stations nearest the base. The outlying six had been planned for today. Routine travel around Kyril Island was accomplished in an all-terrain vehicle called a scat-cat, which had turned out to be almost as much fun to drive as an anti-grav sled. Scat-cats were ground-hugging iridescent teardrops that tore up the tundra, but were guaranteed not to blow away in the wah-wah winds. Base personnel, Miles had been given to understand, had grown extremely tired of picking lost anti-grav sleds out of the frigid sea.

The motor pool was another half-buried bunker like most of the rest of Lazkowski Base, only bigger. Miles routed out the corporal, what's his name, Olney, who'd signed Ahn and himself out the previous day. The tech who assisted him, driving the scat-cat up from the underground storage to the entrance, also looked faintly familiar. Tall, black fatigues, dark hair—that described eighty percent of the men on the base—it wasn't until he spoke that his heavy accent cued Miles. He was one of the sotto voice commenters Miles had overheard on the shuttlepad. Miles schooled himself not to react.

Miles went over the vehicle's supply check-list carefully before signing for it, as Ahn had taught him. All scat-cats were required to carry a complete cold-survival kit at all times. Corporal Olney watched with faint contempt as Miles fumbled around finding everything. *All right, so I'm slow*, Miles thought irritably. *New and green. This is the only way I'm gonna get less new and green. Step by step.* He controlled his self-consciousness with an effort. Previous painful experience had taught him it was a most dangerous frame of mind. *Concentrate on the task, not the bloody audience. You've always had an audience. Probably always will.*

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Miles spread out the map flimsy across the scat-cat's shell, and pointed out his projected itinerary to the corporal. Such a briefing was also safety SOP, according to Ahn. Olney grunted acknowledgment with a finely-tuned look of long-suffering boredom, palpable but just short of something Miles would be forced to notice.

The black-clad tech, Pattas, watching over Miles's uneven shoulder, pursed his lips and spoke. "Oh, Ensign *sir*." Again, the emphasis fell just short of irony. "You going up to Station Nine?"

"Yes?"

"You might want to be sure and park your scat-cat, uh, out of the wind, in that hollow just below the station." A thick finger touched the map flimsy on an area marked in blue. "You'll see it. That way your scat-cat'll be sure of restarting."

"The power pack in these engines is rated for space," said Miles. "How could it not restart?"

Olney's eye lit, then went suddenly very neutral. "Yes, but in case of a sudden wah-wah, you wouldn't want it to blow away."

I'd blow away before it would. "I thought these scat-cats were heavy enough not to."

"Well, not *away*, but they have been known to blow *over*," murmured Pattas.

"Oh. Well, thank you."

Corporal Olney coughed. Pattas waved cheerfully as Miles drove out.

Miles's chin jerked up in the old nervous tic. He took a deep breath and let his hackles settle, as he turned the scat-cat away from the base and headed cross-country. He powered up to a more satisfying speed, lashing through the brown bracken-like growth. He had been what, a year and a half? two years? at the Imperial Academy proving and re-proving his competence to every bloody man he crossed every time he did anything. The third year had perhaps spoiled him, he was out of practice. Was it going to be like this every time he took up a new post? Probably, he reflected bitterly, and powered up a bit more. But he'd known that would be part of the game when he'd demanded to play.

The weather was almost warm today, the pale sun almost bright, and Miles almost cheerful by the time he reached Station Six, on the eastern shore of the island. It was a pleasure to be alone for a change, just him and his job. No audience. Time to take his time and get it all right. He worked carefully, checking power packs, emptying samplers, looking for signs of corrosion, damage, or loose connections in the equipment. And if he dropped a tool, there was no one about to make comments about spastic mutants. With the fading tension, he made fewer fumbles, and the tic vanished. He finished, stretched, and inhaled the damp air benignly, reveling in the unaccustomed luxury of solitude. He even took a few minutes to walk along the shore-line, and notice the intricacies of the small sea-life washed up there.

One of the samplers in Station Eight was damaged, a humidity-meter shattered. By the time he'd replaced it he realized his itinerary timetable had been overly optimistic. The sun was slanting down toward green twilight as he left Station Eight. By the time he reached

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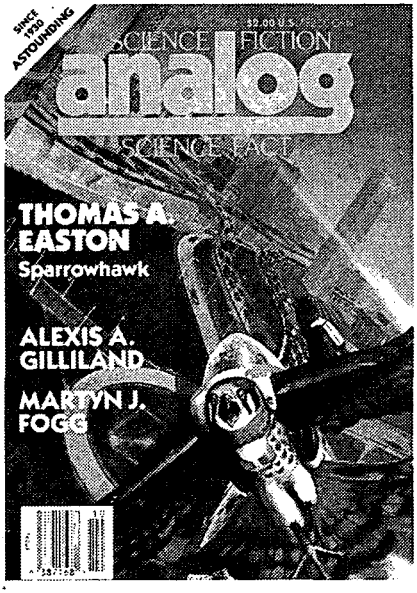

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Station Nine, in an area of mixed tundra and rocky outcrops near the northern shore, it was almost dark.

Station Ten, Miles reconfirmed by checking his map flimsy by pen-light, was up in the volcanic mountains among the glaciers. Best not try to go hunting it in the dark. He would wait out the brief four hours till dawn. He reported his change-of-plan via comm-link to the base, 160 kilometers to the south. The man on duty did not sound terribly interested. Good.

With no watchers, Miles happily seized the opportunity to try out all that fascinating gear packed in the back of the scat-cat. Far better to practice now, when conditions were good, than in the middle of some later blizzard. The little two-man bubble shelter, when set up, seemed almost palatial for Miles's short and lonely splendor. In winter it was meant to be insulated with packed snow. He positioned it downwind of the scat-cat, parked in the recommended low spot a few hundred meters from the weather station, which was perched on a rocky outcrop.

Miles reflected on the relative weight of the shelter versus the scat-cat. A vid that Ahn had shown him of a typical wah-wah remained vivid in his mind. The portable latrine traveling sideways in the air at a hundred kilometers an hour had been particularly impressive. Ahn hadn't been able to tell him if there'd been anyone in it at the time the vid was shot. Miles took the added precaution of attaching the shelter to the scat-cat with a short chain. Satisfied, he crawled inside.

The equipment was first-rate. He hung a heat-tube from the roof and touched it on, and basked in its glow, sitting cross-legged. Rations were of the better grade. A pull tab heated a compartmentalized tray of stew with vegetables and rice. He mixed an acceptable fruit drink from the powder supplied. After eating and stowing the remains, he settled on a comfortable pad, shoved a book-disk into his viewer, and prepared to read away the short night.

He had been rather tense these last few weeks. These last few years. The book-disk, a Betan novel of manners which the Countess had recommended to him, had nothing whatsoever to do with Barrayar, military maneuvers, mutation, politics, or the weather. He didn't even notice what time he dozed off.

He woke with a start, blinking in the thick darkness gilded only with the faint copper light from the heat-tube. He felt he had slept long, yet the transparent sectors of the bubble-shelter were pitchy black. An unreasoning panic clogged his throat. Dammit, it didn't matter if he overslept, it wasn't like he would be late for an exam, here. He glanced at the glowing readout on his wrist chrono.

It ought to be broad daylight.

The flexible walls of the shelter were pressing inward. Not one-third of the original volume remained, and the floor was wrinkled. Miles shoved one finger against the thin cold plastic. It yielded slowly, like soft butter, and retained the dented impression. What the *hell* . . . ?

His head was pounding, his throat constricted, the air was stuffy and wet. It felt just like . . . like oxygen depletion and CO_2 excess in a space emer-

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gency. *Here?* The vertigo of his disorientation seemed to tilt the floor.

The floor *was* tilted, he realized indignantly, pulled deeply downward on one side, pinching one of his legs. He convulsed from its grip. Fighting the CO_2-induced panic, he lay back, trying to breathe slower and think faster.

I'm underground. Sunk in some kind of quicksand. Quick-mud. Had those two bloody bastards at the motor-pool set him up for this? He'd fallen for it, fallen right in it.

Slow-mud, maybe. The scat-cat hadn't settled noticably in the time it had taken him to set up this shelter. Or he would have twigged to the trap. Of course, it had been dark. But if he'd been settling for hours, asleep. . . .

Relax, he told himself frantically. The tundra surface, the free air, might be a mere ten centimeters overhead. Or ten meters . . . *relax!* He felt about the shelter for something to use as a probe. There'd been a long, telescoping, knife-bitted tube for sampling glacier ice. Packed in the scat-cat. Along with the comm link. Now located, Miles gauged by the angle of the floor, about two-and-a-half meters down and to the west of his present location. It was the scat-cat that was dragging him down. The bubble-shelter alone might well have floated in the tundra-camouflaged mud-pond. If he could detach the chain, might it rise? Not fast enough. His chest felt stuffed with cotton. He had to break through to air soon, or asphyxiate. Womb, tomb. Would his parents be there to watch, when he was found at last, when this grave was opened, scat-cat and shelter winched out of the bog by heavy hovercab. . . . his body frozen rictus-mouthed in this hideous parody of an amniotic sac . . . *relax.*

He stood, and shoved upward against the heavy roof. His feet sank in the pulpy floor, but he was able to jerk loose one of the bubble's interior ribs, now bent in an overstrained curve. He almost passed out from the effort, in the thick air. He found the top edge of the shelter's opening, and slid his finger down the burr-catch just a few centimeters. Just enough for the pole to pass through. He'd feared the black mud would pour in, drowning him at once, but it only crept in extrusive blobs, to fall with oozing plops. The comparison was obvious and repulsive. *God, and I thought I'd been in deep shit before.*

He shoved the rib upward. It resisted, slipping in his sweating palms. Not ten centimeters. Not twenty. A meter, a meter and a third, and he was running short on probe. He paused, took a new grip, shoved again. Was the resistance lessening? Had he broken through to the surface? He heaved it back and forth, but the sucking slime sealed it still.

Maybe, maybe a little less than his own height between the top of the shelter and breath. Breath, death. How long to claw through it? How fast did a hole in this stuff close? His vision was darkening, and it wasn't because the light was going dim. He turned the heat tube off and stuck it in the front pocket of his jacket. The uncanny dark shook him with horror. Or perhaps it was the CO_2. Now or never.

On an impulse, he bent and loosened his boot-catches and belt buckle, then zipped open the burr by feel. He began to dig like a dog, heaving big globs of mud down into the little space left in

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the bubble. He squeezed through the opening, braced himself, took his last breath, and pressed upward.

His chest was pulsing, his vision a red blur, when his head broke the surface. Air! He spat black muck and bracken bits, and blinked, trying with little success to clear his eyes and nose. He fought one hand up, then the other, and tried to pull himself up horizontal, flat like a frog. The cold confounded him. He could feel the muck closing around his legs, numbing like a witch's embrace. His toes pressed at full extension on the shelter's roof. It sank and he rose a centimeter. The last of the leverage he could get by pushing. Now he must pull. His hands closed over bracken. It gave. More. More. He was making a little progress, the cold air raking his grateful throat. The witch's grip tightened. He wriggled his legs, futilely, one last time. All right, now. Heave!

His legs slid out of his boots and pants, his hips sucked free, and he rolled away. He lay spread-eagled for maximum support on the treacherous surface, face up to the grey swirling sky. His uniform jacket and long underwear were soaked with slime, and he'd lost one thermal sock, as well as both boots and his trousers.

It was sleeting.

They found him hours later, curled around the dimming heat-tube, crammed into an eviscerated equipment bay in the automated weather station. His eye-sockets were hollow in his black-streaked face, his toes and ears white. His numb purple fingers jerked two wires across each other in a steady, hypnotic tatoo, the Service emergency code. To be read out in bursts of static in the barometric pressure meter in base's weather room. If and when anybody bothered to look at the suddenly-defective reading from this station, or noticed the pattern in the white noise.

His fingers kept twitching in this rhythm for minutes after they pulled him free of his little box. Ice cracked off the back of his uniform jacket as they tried to straighten his body. For a long time they could get no words from him at all, only a shivering hiss. Only his eyes burned.

Floating in the heat tank in the base infirmary, Miles considered crucifixion for the two saboteurs from the motor pool from several angles. Such as upside-down. Dangling over the sea at low altitude from an anti-grav sled. Better still, staked out face-up in a bog in a blizzard. . . . But by the time his body had warmed up, and the corpsman had pulled him out of the tank to dry, be reexamined, and eat a supervised meal, his head had cooled.

It hadn't been an assassination attempt. And therefore, not a matter he was compelled to turn over to Simon Illyan, dread Chief of Imperial Security and Miles's father's left-hand man. The vision of the sinister officers from Imperial Security coming to take those two jokers away, far away, was lovely, but impractical, like shooting mice with a maser cannon. Anyway, where could Imperial Security possibly send them that was worse than here?

They'd meant his scat-cat to bog, to be sure, while he serviced the weather station, and for Miles to have the em-

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barrassment of calling the base for heavy equipment to pull it out. Embarrassing, not lethal. They could not have—no one could have—forseen Miles's inspired safety-conscious precaution with the chain, which was in the final analysis what had almost killed him. At most it was a matter for Service Security, bad enough, or for normal discipline.

He dangled his toes over the side of his bed, one of a row in the empty infirmary, and pushed the last of his food around on his tray. The corpsman wandered in, and glanced at the remains.

"You feeling all right now, sir?"

"Fine," said Miles morosely.

"You, uh, didn't finish your tray."

"I often don't. They always give me too much."

"Yeah, I guess you are pretty, um . . ." The corpsman made a note on his report panel, leaned over to examine Miles's ears, and bent to inspect his toes, rolling them between practiced fingers. "It doesn't look like you're going to lose any pieces, here. Lucky."

"Do you treat a lot of frostbite?" *Or am I the only idiot?* Present evidence would suggest it.

"Oh, once the grubs arrive, this place'll be crammed. Frostbite, pneumonia, broken bones, contusions, concussions . . . gets real lively, come winter. Wall-to-wall moro—unlucky trainees. And a few unlucky instructors, that they take down with 'em." The corpsman stood, and tapped a few more entries on his panel. "I'm afraid I have to mark you as recovered now, sir."

"Afraid?" Miles raised his brows inquiringly.

The corpsman straightened, in the unconscious posture of a man transmitting official bad news. That old they-told-me-to-say-this-it's-not-my-fault look. "You are ordered to report to the base commander's office as soon as I release you, sir."

Miles considered an immediate relapse. No. Better to get the messy parts over with. "Tell me, corpsman, has anyone else ever sunk a scat-cat?"

"Oh, sure. The grubs lose about five or six a season. Plus minor bog-downs. The engineers get real pissed about it. The commandant promised them next time he'd . . . ahem!" The corpsman lost his voice, suddenly.

Wonderful, thought Miles. Just great. He could see it coming. It wasn't like he couldn't see it coming.

Miles dashed back to his quarters for a quick change of clothing, guessing a hospital robe might be inappropriate for the coming interview. He immediately found he had a minor quandry. His black fatigues seemed too relaxed, his dress greens too formal for office wear anywhere outside Imperial HQ at Vorbarr Sultana. His undress greens' trousers and half-boots were still at the bottom of the bog. He had only brought one of each uniform style with him; his spares, supposedly in transit, had not yet arrived.

He was hardly in a position to borrow from a neighbor. His uniforms were privately made to his own fit, at approximately four times the cost of Imperial issue. Part of that cost was for the effort of making them indistinguishable on the surface from the machine cut, while at the same time partially masking the oddities of his body through subtle-

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ties of hand-tailoring. He cursed under his breath, and shucked on his dress greens, complete with mirror-polished boots to the knees. At least the boots obviated the leg braces.

General Stanis Metzov, read the sign on the door, *Base Commander*. Miles had been assiduously avoiding the base commander ever since their first unfortunate encounter. This had not been hard to do in Ahn's company; despite the pared population of Kyril Island this month; Ahn avoided everybody. Miles now wished he'd tried harder to strike up conversations with brother officers in mess. Permitting himself to stay isolated, even to concentrate on his new tasks, had been a mistake. In five days of even the most random conversation, someone must surely have mentioned Kyril Island's voracious killer mud.

A corporal manning the comconsole in an antechamber ushered Miles through to the inner office. He must now try to work himself back round to Metzov's good side, assuming the general had one. Miles needed allies. General Metzov looked across his desk unsmiling as Miles saluted and stood waiting.

Today, the general was aggressively dressed in black fatigues. At Metzov's altitude in the hierarchy, this stylistic choice usually indicated a deliberate identification with The Fighting Man. The only concession to his rank was their pressed neatness. His decorations were stripped down to a mere modest three, all high combat commendations. Pseudo-modest, pruned of the surrounding foliage, they leapt to the eye. Mentally, Miles applauded, even envied, the effect. Metzov looked his part, the combat commander, absolutely, unconsciously natural.

A fifty-fifty chance with the uniform, and I had to guess wrong, Miles fumed as Metzov's eye traveled sarcastically down, and back up, the subdued glitter of his dress greens. All right, so Metzov's eyebrows signalled, Miles now looked like some kind of Vorish headquarters twit. Not that that wasn't another familiar type. Miles decided to decline the roasting and cut Metzov's inspection short by forcing the opening.

"Yes, sir?"

Metzov leaned back in his chair, lips twisting. "I see you found some pants, Ensign Vorkosigan. And, ah . . . riding boots, too. You know, there are no horses on this island."

None at Imperial Headquarters, either, Miles thought irritably. *I didn't design the damn boots*. His father had once suggested his staff officers must need them for riding hobbyhorses, high horses, and nightmares. Unable to think of a useful reply to the general's sally, Miles stood in dignified silence, chin lifted, parade rest. "Sir."

Metzov leaned forward, clasping his hands, abandoning his heavy humor, eyes gone hard again. "You lost a valuable, fully-equipped scat-cat as a result of leaving it parked in an area clearly marked as a Permafrost Inversion Zone. Don't they teach map-reading at the Imperial Academy any more, or is it to be all diplomacy in the New Service—how to drink tea with the ladies?"

Miles called up the map in his mind. He could see it clearly. "The blue areas were labelled P.I.Z. Those initials were not defined. Not in the key or anywhere."

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"Then I take it you also failed to read your manual."

He'd been buried in manuals ever since he'd arrived. Weather office procedurals, equipment tech-specs . . . "Which one, sir?"

"Lazkowski Base Regulations."

Miles tried frantically to remember if he'd ever seen such a disk. "I . . . think Lieutenant Ahn may have given me a copy . . . night before last." Ahn had in fact dumped an entire carton of disks out on Miles's bed in officers' quarters. He was doing some preliminary packing, he'd said, and was willing Miles his library. Miles had read two weather disks before going to sleep that night. Ahn, clearly, had returned to his own cubicle to do a little preliminary celebrating. The next morning Miles had taken the scat-cat out. . . .

"And you haven't read it yet?"

"No, sir."

"Why not?"

I was set up, Miles's thought wailed. He could feel the highly-interested presence of Metzov's clerk, undismissed, standing witness by the door behind him. Making this a public, not a private, dressing-down. And if only he'd read the damn manual, would those two bastards from the motor pool have even been *able* to set him up? Will or nill, he was going to get down-checked for this one. "No excuse, sir."

"Well, Ensign, in Chapter Three of Lazkowski Base Regulations you will find a complete description of all the permafrost zones, together with the rules for avoiding them. You might look into it, when you can spare a little leisure from . . . drinking tea."

"Yes, sir." Miles's face was set like glass. The general had a right to skin him with a vibra-knife, if he chose—in *private*. The authority lent Miles by his uniform barely balanced the deformities that made him a target of Barrayar's historically-grounded, intense genetic prejudices. A public humiliation that sapped that authority before men he must also command came very close to an act of sabotage. Deliberate, or unconscious?

The general was only warming up. "The Service may still provide warehousing for excess Vor lordlings at Imperial Headquarters, but out here in the real world, where there's fighting to be done, we have no use for drones. Now, I fought my way up through the ranks. I saw casualties in Vordarian's Pretendership before you were born—"

I WAS a casualty in Vordarian's Pretendership before I was born, thought Miles, his irritation growing wilder. The soltoxin gas that had almost killed his pregnant mother and made Miles what he was, had been a purely military poison.

"—and I fought the Komarr Revolt. You infants who've come up in the past decade and more have no concept of combat. These long periods of unbroken peace weaken the Service. If they go on much longer, when a crisis comes there'll be no one left who's had any real practice in a crunch."

Miles's eyes crossed slightly, from internal pressure. *Then should His Imperial Majesty provide a war every five years, as a convenience for the advancement of his officers' careers?* His mind boggled slightly over the concept of "real practice." Had Miles maybe acquired his first clue why this superb-

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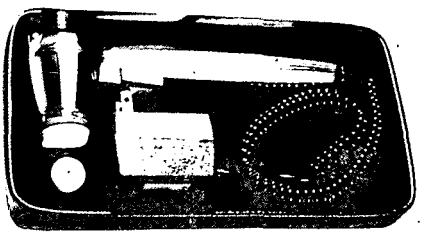

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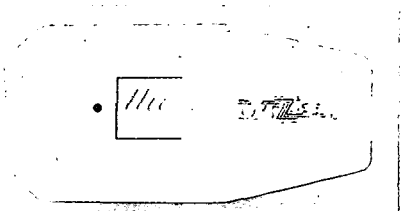

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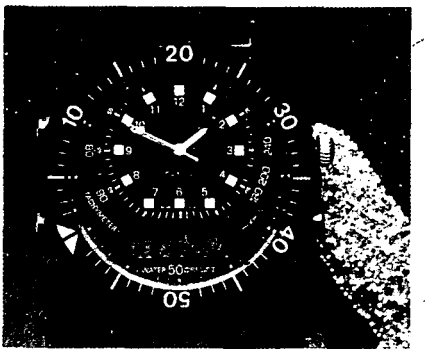

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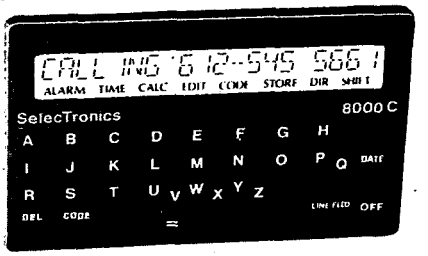
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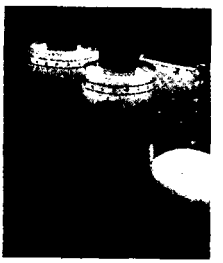

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looking officer had washed up on Kyril Island?

Metzov was still expanding, self-stimulated. "In a real combat situation, a soldier's equipment is vital. It can be the difference between victory and defeat. A man who loses his equipment loses his effectiveness as a soldier. A man disarmed in a technological war might as well be a woman, useless! And you disarmed *yourself!*"

Miles wondered sourly if the general would then agree that a woman armed in a technological war might as well be a man. . . . no, probably not. Not a Barrayaran of his generation.

Metzov's voice descended again, dropping from military philosophy to the immediately practical. Miles was relieved. "The usual punishment for a man bogging a scat-cat is to dig it out himself. By hand. I understand that won't be feasible, since the depth to which you sank yours is a new camp record. Nevertheless, you will report at 1400 to Lieutenant Bonn of Engineering, to assist him as he sees fit."

Well, that was certainly fair. And would probably be educational, too. Miles prayed this interview was winding down. *Dismissed, now?* But the general fell silent, squinty-eyed and thoughtful.

"For the damage you did to the weather station," Metzov began slowly, then sat up more decisively—his eyes, Miles could almost swear, lighting with a faint red glow, the corner of that seamed mouth twitching upward, "you will supervise basic-labor detail for one week. Four hours a day. That's in addition to your other duties. Report to Sergeant Neuve, in Maintenance, at 0500 daily."

A slight choked inhalation sounded from the corporal still standing behind Miles, which Miles could not interpret. Laughter? Horror?

But . . . *unjust!* And he would lose a significant fraction of the precious time remaining to decant technical expertise from Ahn. . . . "The damage I did to the weather station was not a stupid accident like the scat-cat, sir! It was necessary, to my survival."

General Metzov fixed him with a very cold eye. "Make that six hours a day, Ensign Vorkosigan."

Miles spoke through his teeth, words jerked out as though by pliers. "Would you have preferred the interview you'd be having right now if I'd permitted myself to freeze, sir?"

Silence fell, very dead. Swelling, like a road-killed animal in the summer sun.

"You are dismissed, Ensign," General Metzov hissed at last. His eyes were glittering slits.

Miles saluted, about-faced, and marched, stiff as any ancient ramrod. Or board. Or corpse. His blood beat in his ears; his chin jerked upward. Past the corporal, who was standing at attention doing a fair imitation of a waxwork. Out the door, out the outer door. Alone at last in the Administration Building's lower corridor.

Miles cursed himself silently, then out loud. He really had to try to cultivate a more normal attitude toward senior officers. It was his bloody upbringing that lay at the root of the problem, he was sure. Too many years of tripping over herds of generals, admirals, and senior staff at Vorkosigan House, at lunch, dinner, all hours. Too much time sitting quiet as a mouse, cultivating in-

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visibility, permitted to listen to their extremely blunt arguments and debate on a hundred topics. He saw them as they saw each other, maybe. When a normal ensign looked at his commander, he ought to see a god-like being, not a, a . . . future subordinate. New ensigns were supposed to be a subhuman species anyway.

And yet . . . *What is it about this guy Metzov?* He'd met others of the type before, of assorted political stripes. Many of them were cheerful and effective soldiers, as long as they stayed out of politics. As a party, the military conservatives had been eclipsed ever since the bloody fall of the cabal of officers responsible for the disastrous Escobar invasion, over two decades ago. But the danger of revolution from the far right, some would-be junta assembling to save the Emperor from his own government, remained quite real in Miles's father's mind, he knew.

So, was it some subtle political odor emanating from Metzov that had raised the hairs on the back of Miles's neck? Surely not. A man of real political subtlety would seek to use Miles, not abuse him. *Or are you just pissed because he stuck you on some humiliating garbage detail?* A man didn't have to be politically extreme to take a certain sadistic joy in sticking it to a representative of the Vor class. Could be Metzov had been diddled in the past himself by some arrogant Vor lord. Political, social, genetic . . . the possibilities were endless.

Miles shook the static from his head, and limped off to change to his black fatigues and locate Base Engineering. No help for it now, he was sunk deeper than his scat-cat. He'd simply have to avoid Metzov as much as possible for the next six months. Anything Ahn could do so well, Miles could surely do too.

Lieutenant Bonn prepared to probe for the scat-cat. The engineering lieutenant was a slight man, maybe twenty-eight or thirty years old, with a craggy face surfaced with pocked sallow skin, reddened by the climate. Calculating brown eyes, competent-looking hands, and a sardonic air which, Miles sensed, might be permanent and not merely directed at himself. Bonn and Miles squished about atop the bog, while two engineering techs in black insulated coveralls sat perched on their heavy hovercab, safely parked on a nearby rocky outcrop. The sun was pale, the endless wind cold and damp.

"Try about there, sir," Miles suggested, pointing, trying to estimate angles and distances in a place he had only seen at dusk. "I think you'll have to go down at least two meters."

Lieutenant Bonn gave him a joyless look, raised his long metal probe to the vertical, and shoved it into the bog. It jammed almost immediately. Miles frowned puzzlement. Surely the scat-cat couldn't have floated upward. . . .

Bonn, looking unexcited, leaned his weight into the rod and twisted. It began to grind downward.

"What did you run into?" Miles asked.

"Ice," Bonn grunted. " 'Bout three centimeters thick right now. We're standing on a layer of ice, underneath this surface crud, just like a frozen lake except it's frozen mud."

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Miles stamped experimentally. Wet, but solid. Much as it had felt when he had camped on it.

Bonn, watching him, added, "The ice thickness varies with the weather. From a few centimeters to solid-to-the-bottom. Midwinter, you could park a freight shuttle on this bog. Come summer, it thins out. It can thaw from seeming-solid to liquid in a few hours, when the temperature is just right, and back again."

"I . . . think I found that out."

"Lean," ordered Bonn laconically, and Miles wrapped his hands around the rod and helped shove. He could feel the scrunch as it scraped past the ice layer. And if the temperature had dropped a little more, the night he'd sunk himself, and the mud refrozen, would he have been able to punch up through the icy seal? He shuddered inwardly, and zipped his parka half-up, over his black fatigues.

"Cold?" said Bonn.

"Thinking."

"Good. Make it a habit." Bonn touched a control, and the rod's sonic probe beeped at a teeth-aching frequency. The readout displayed a bright teardrop shape a few meters over. "There it is." Bonn eyed the numbers on the readout. "It's really down there, isn't it? I'd let you dig it out with a teaspoon, ensign, but I suppose winter would set in before you were done." He sighed, and stared down at Miles as though picturing the scene.

Miles could picture it, too. "Yes, sir," he said carefully.

They pulled the probe back out. Cold mud slicked the surface under their gloved hands. Bonn marked the spot and waved to his techs. "Here, boys!" They waved back, hopped down off the hovercab, and swung within. Bonn and Miles scrambled well out of the way, on to the rocks toward the weather station.

The hovercab whined into the air and positioned itself over the bog. Its heavy-duty space-rated tractor beam punched downward. Mud, plant matter, and ice geysered out in all directions with a roar. In a couple of minutes, the beam had created an oozing crater, with a glimmering pearl at the bottom. The crater's sides began to slump inward at once, but the hovercab operator narrowed and reversed his beam, and the scat-cat rose, noisily sucking free from its matrix. The limp bubble shelter dangled repellently from its chain. The hovercab set its load down delicately in the rocky area, and landed beside it.

Bonn and Miles trooped over to view the sodden remains. "You weren't *in* that bubble-shelter, were you, ensign?" said Bonn, prodding it with his toe.

"Yes, sir, I was. Waiting for daylight. I . . . fell asleep."

"But you got out before it sank."

"Well, no. When I woke up, it was all the way under."

Bonn's crooked eyebrows rose. "How far?"

Miles's flat hand found the level of his chin.

Bonn looked startled. "How'd you get out of the suction?"

"With difficulty. And adrenalin, I think. I slipped out of my boots and pants. Which reminds me, may I take a minute and look for my boots, sir?"

Bonn waved a hand, and Miles trudged back out onto the bog, circling the ring

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of muck spewed from the tractor beam, keeping a safe distance from the now water-filling crater. He found one mud-coated boot, but not the other. Should he save it, on the off-chance he might have one leg amputated someday? It would probably be the wrong leg. He sighed, and climbed back up to Bonn.

Bonn frowned down at the ruined boot dangling from Miles's hand. "You could have been killed," he said in a tone of realization.

"Three times over. Smothered in the bubble shelter, trapped in the bog, or frozen waiting for rescue."

Bonn gave him a penetrating stare. "Really." He walked away from the deflated shelter, idly, as if seeking a wider view. Miles followed. When they were out of earshot of the techs, Bonn stopped and scanned the bog. Conversationally, he remarked, "I heard — unofficially—that a certain motor-pool tech named Pattas was bragging to one of his mates that he'd set you up for this. And you were too stupid to even realize you'd been had. That bragging could have been . . . not too bright, if you'd been killed."

"If I'd been killed, it wouldn't have mattered if he'd bragged or not," Miles shrugged. "What a Service investigation missed, I flat guarantee the Imperial Security investigation would have found."

'You knew you'd been set up?" Bonn studied the horizon.

"Yes."

"I'm surprised you didn't call Imperial Security in, then."

"Oh? Think about it, sir."

Bonn's gaze returned to Miles, as if taking inventory of his distasteful deformities. "You don't add up for me, Vorkosigan. Why did they let you in the Service?"

"Why d'you think?"

"Vor privilege."

"Got it in one."

"Then why are you here? Vor privilege gets sent to HQ."

"Vorbarr Sultana is lovely this time of year," said Miles agreeably. And how was his cousin Ivan enjoying it right now? "But I want ship duty."

"And you couldn't arrange it?" said Bonn skeptically.

"I was told to earn it. That's why I'm here. To prove I can handle the Service. Or . . . not. Calling in a wolf pack from ImpSec within a week of my arrival to turn the base and everyone on it inside-out looking for assassination conspiracies—where, I judge, none exist—would not advance me toward my goal. No matter how entertaining it might be." Messy charges, his word against their two words—even if Miles had pushed it to a formal investigation, with fast-penta to prove him right; the ruckus could hurt him far more in the long run than his two tormentors. No. No revenge was worth the *Prince Serg*.

"The motor pool is in Engineering's chain of command. If Imperial Security fell on it, they'd also fall on me." Bonn's brown eyes glinted.

"You're welcome to fall on anyone you please, sir. But if you have unofficial ways of receiving information, it follows you must have unofficial ways of sending it, too. And after all, you've only my word for what happened." Miles hefted his useless single boot, and heaved it back into the bog.

Thoughtfully, Bonn watched it arc

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and splash down in a pool of brown melt-water. "A Vor lord's word?"

"Means nothing in these degenerate days." Miles bared his teeth in a smile of sorts. "Ask anyone."

"Huh." Bonn shook his head, and started back toward the hovercab.

Next morning Miles reported to the maintenance shed for the second half of the scat-cat retrieval job, cleaning all the mud-caked equipment. The sun was bright today, and had been up for hours, but Miles's body knew it was only 0500. An hour into his task he'd begun to warm up, feel better, and get into the rhythm of the thing.

At 0630, the deadpan Lieutenant Bonn arrived, and delivered two helpers unto Miles.

"Why, Corporal Olney. Tech Pattas. We meet again." Miles smiled with acid cheer. The pair exchanged an uneasy look. Miles kept his demeanor absolutely even.

He then kept everyone, starting with himself, moving briskly. The conversation seemed to automatically limit itself to brief, wary technicalities. By the time Miles had to knock off and go report to Lieutenant Ahn, the scat-cat and most of the gear had been restored to better condition than when Miles had received it.

He wished his two helpers, now driven to near-twitchiness by uncertainty, an earnest good day. Well, if they hadn't figured it out by now, they were hopeless. Miles wondered bitterly why he seemed to have so much better luck establishing rapport with bright men like Bonn. Cecil had been right, if Miles couldn't figure out how to command the dull as well, he'd never make it as a Service officer. Not at Camp Permafrost, anyway.

The following morning, the third of his official punishment seven, Miles presented himself to Sergeant Neuve. The sergeant in turn presented Miles with a scat-cat full of equipment, a disk of the related equipment manuals, and the schedule for drain and culvert maintenance for Lazkowski Base. Clearly, it was to be another learning experience. Miles wondered if General Metzov had selected this task personally. He rather thought so.

On the bright side, he had his two helpers back again. This particular civil engineering task had apparently never fallen on Olney or Pattas before either, so they had no edge of superior knowledge with which to trip Miles. They had to stop and read the manuals first, too. Miles swotted procedures and directed operations with a good cheer that edged toward manic as his helpers became glummer.

There was, after all, a certain fascination to the clever drain-cleaning devices. And excitement. Flushing pipes with high pressure could produce some surprising effects. There were chemical compounds that had some quite military properties, such as the ability to dissolve anything instantly, including human flesh. In the following three days Miles learned more about the infrastructure of Lazkowski Base than he'd ever imagined wanting to know. He'd even calculated the point where one well-placed charge could bring the entire system down, if he ever decided he wanted to destroy the place.

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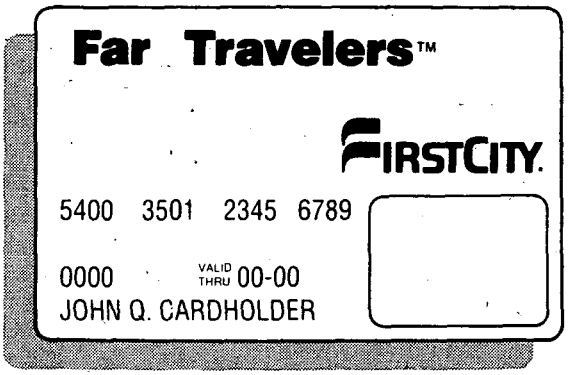

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On the sixth day, Miles and his team were sent to clear a blocked culvert out by the grubs' practice fields. It was easy to spot. A silver sheet of water lapped the raised roadway on one side; on the other only a feeble trickle emerged to creep away down the bottom of a deep ditch.

Miles took a long telescoping pole from the back of their scat-cat, and probed down into the water's opaque surface. Nothing seemed to be blocking the flooded end of the culvert. Whatever it was must be jammed farther in. Joy. He handed the pole back to Pattas and wandered over to the other side of the road, and stared down into the ditch. The culvert, he noted, was something over half a meter in diameter. "Give me a light," he said to Olney.

He shucked his parka and tossed it into the scat-cat, and scrambled down into the ditch. He aimed his light into the aperture. The culvert evidently curved slightly; he couldn't see a damned thing. He sighed, considering the relative width of Olney's shoulders, Pattas's, and his own.

Could there be anything further from ship duty than this? The closest he'd come to anything of a sort was spelunking in the Dendarii Mountains. Earth and water, versus fire and air. He seemed to be building up a helluva supply of yin, the balancing yang to come had better be stupendous.

He gripped the light tighter, dropped to hands and knees, and shinnied into the drain.

The icy water soaked the trouser knees of his black fatigues. The effect was numbing. Water leaked around the top of one of his gloves. It felt like a knife blade on his wrist.

Miles meditated briefly on Olney and Pattas. They had developed a cool, reasonably efficient working relationship over the last few days, based, Miles had no illusions, on a fear of God instilled in the two men by Miles's good angel Lieutenant Bonn. How did Bonn accomplish that quiet authority, anyway? He had to figure that one out. Bonn was good at his job, for starters, but what else?

Miles scraped round the curve, shone his light on the clot, and recoiled, swearing. He paused a moment to regain control of his breath, examined the blockage more closely, and backed out.

He stood up in the bottom of the ditch, straightening his spine vertebra by creaking vertebra. Corporal Olney stuck his head over the road's railing, above. "What's in there, ensign?"

Miles grinned up at him, still catching his breath. "Pair of boots."

"That's all?" said Olney.

"Their owner is still wearing 'em."

Miles called the base surgeon on the scat-cat's comm link, urgently requesting his presence with forensic kit, body bag, and medical transport. Miles and his crew then blocked the upper end of the drain with a plastic signboard forcibly borrowed from the empty practice field beyond. Now so thoroughly wet and cold that it made no difference, Miles crawled back into the culvert to attach a rope to the anonymous booted ankles. When he emerged, the surgeon and his corpsman had arrived.

The surgeon, a big, balding man, peered dubiously into the drainpipe.

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"What could you see in there, ensign? What happened?"

"I can't see anything from this end but legs, sir," Miles reported. "He's got himself wedged in there but good. Drain crud up above him, I'd guess. We'll have to see what spills out with him."

"What the hell was he doing in there?" The surgeon scratched his freckled scalp.

Miles spread his hands. "Seems a peculiar way to commit suicide. Slow and chancy, as far as drowning yourself goes."

The surgeon raised his eyebrows in agreement. Miles and the surgeon had to lend their weight on the rope to Olney, Pattas, and the corpsman before the stiff form wedged in the culvert began to scrape free.

"He's *stuck*," observed the corpsman, grunting. The body jerked out at last with a gush of dirty water. Pattas and Olney stared from a distance; Miles glued himself to the surgeon's shoulder. The corpse, dressed in sodden black fatigues, was waxy and blue. His collar tabs and the contents of his pockets identified him as a private from Supply. His body bore no obvious wounds, but for bruised shoulders and scraped hands.

The surgeon spoke clipped, negative preliminaries into his recorder. No broken bones, no nerve disruptor blisters. Preliminary hypothesis, death from drowning or hypothermia or both, within the last twelve hours. He flipped off his recorder and added over his shoulder, "I'll be able to tell for sure when we get him laid out back at the infirmary."

"Does this sort of thing happen often around here?" Miles inquired mildly.

The surgeon shot him a sour look. "I slab a few idiots every year. What d'you expect, when you put five thousand kids between the ages of eighteen and twenty together on an island and tell 'em to go play war? I admit, this one seems to have discovered a completely new method of slabbing himself. I guess you never see it all."

"You think he did it to himself, then?" True, it would be real tricky to kill a man and *then* stuff him in there.

The surgeon wandered over to the culvert and squatted, and stared into it. "So it would seem. Ah, would you take one more look in there, ensign, just in case?"

"Very well, sir." Miles hoped it was the last trip. He'd never have guessed drain cleaning would turn out to be so . . . thrilling. He slithered all the way under the road to the leaky board, checking every centimeter, but found only the dead man's dropped hand light. So. The private had evidently entered the pipe on purpose. With intent. What intent? Why go culvert-crawling in the middle of the night in the middle of a heavy rainstorm? Miles skinned back out and turned the light over to the surgeon.

Miles helped the corpsman and surgeon bag and load the body, then had Olney and Pattas raise the blocking board and return it to its original location. Brown water gushed, roaring, from the bottom end of the culvert and roiled away down the ditch. The surgeon paused with Miles, leaning on the road railing and watching the water level drop in the little lake.

"Think there might be another one

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at the bottom?'' Miles inquired morbidly.

''This guy was the only one listed as missing on the morning report,'' the surgeon replied, ''so probably not.'' He didn't look like he was willing to bet on it, though.

The only thing that did turn up, as the water level fell, was the private's soggy parka. He'd clearly tossed it over the railing before entering the culvert, from which it had fallen or blown into the water. The surgeon took it away with him.

''You're pretty cool about that,'' Pattas noted, as Miles turned away from the back of the medical transport and the surgeon and corpsman drove off.

Pattas was not that much older than Miles himself. ''Haven't you ever had to handle a corpse?''

''No. You?''

''Yes.''

''Where?''

Miles hesitated. Events of three years ago flickered through his memory. The brief months he'd been accidentally caught in desperate combat, far from home, was not a secret to be mentioned, or even hinted at, here. But it had surely taught him the difference between ''practice'' and ''real,'' between war and war games, and that death had subtler vectors than direct touch. ''Before,'' Miles said dampingly. ''Couple of times.''

Pattas shrugged, veering off. ''Well,'' he allowed grudgingly over his shoulder, ''at least you're not afraid to get your hands dirty. Sir.''

Miles's brows crooked, bemused. *No. That's not what I'm afraid of.*

Miles marked the drain ''cleared'' on his report panel, turned the scat-cat, their equipment, and a very subdued Olney and Pattas back in to Sergeant Neuve in Maintenance, and headed for the officers' barracks. He'd never wanted a hot shower more in his entire life.

He was squelching down the corridor toward his quarters, shivering, when another officer stuck his head out a door. ''Ah, Ensign Vorkosigan?''

''Yes?''

''You got a vid call a while ago. I encoded the return for you.''

''Call?'' Miles stopped. ''Where from?''

''Vorbarr Sultana.''

Miles felt a chill in his belly. Some emergency at home? ''Thanks.'' He reversed direction, and beelined for the end of the corridor and the vidconsole booth that the officers on this level shared.

He slid damply into the seat and punched up the message. The number was not one he recognized. He entered it, and his charge code, and waited. It chimed several times, then the vidplate hissed to life. His cousin Ivan's handsome face materialized over it, and grinned at him.

''Ah, Miles. There you are.''

''Ivan! Where the devil are you? What is this?''

''Oh, I'm at home. And that doesn't mean my mother's. I thought you might like to see my new flat.''

Miles had the vague, disoriented sensation that he'd somehow tapped a line into some parallel universe, or alternate astral plane. Vorbarr Sultana, yes. He'd lived in the capital himself, in a previous incarnation. Eons ago.

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Ivan lifted his vid pick-up, and aimed it around, dizzyingly. "It's fully furnished. I took over the lease from an Ops captain who was being transferred to Komarr. A real bargain. I just got moved in yesterday. Can you see the balcony?"

Miles could see the balcony, drenched in late afternoon sunlight the color of warm honey. The Vorbarr Sultana skyline rose like a fairytale city, swimming in the summer haze beyond. Scarlet flowers swarmed over the railing, so red in the level light they almost hurt his eyes. Miles felt like drooling into his shirt pocket, or bursting into tears. "Nice flowers," he choked.

"Yeah, m'girlfriend brought 'em."

"Girlfriend?" Ah yes, human beings had come in two sexes, once upon a time. One smelled much better than the other. Much. "Which one?"

"Tatya."

"Have I met her?" Miles struggled to remember.

"Naw, she's new."

Ivan stopped waving the vid pick-up around, and reappeared over the vid-plate. Miles's exacerbated senses settled slightly. "So how's the weather up there?" Ivan peered at him more closely. "Are you wet? What have you been doing?"

"Forensic . . . plumbing," Miles offered after a pause.

"What?" Ivan's brow wrinkled.

"Never mind." Miles sneezed. "Look, I'm glad to see a familiar face and all that," he was, actually, a painful, strange gladness, "but I'm in the middle of my duty day, here."

"I got off-shift a couple of hours ago," Ivan remarked. "I'm taking Tatya out for dinner in a bit. You just caught me. So just tell me quick, how's life in the infantry?"

"Oh, great. Lazkowski Base is the real thing, y'know." Miles did not define what real thing. "Not a . . . warehouse for excess Vor lordlings like Imperial Headquarters."

"I do my job!" said Ivan, sounding slightly stung. "Actually, you'd like my job. We process information. It's amazing, all the stuff Ops accesses in a day's time. It's like being on top of the world. It would be just your speed."

"Funny. I've thought that Lazkowski Base would be just yours, Ivan. Suppose they could have got our orders reversed?"

Ivan tapped the side of his nose and sniggered. "I wouldn't tell." His humor sobered in a glint of real concern. "You, ah, take care of yourself up there, eh? You really don't look so good."

"I've had an unusual morning. If you'd sod off, I could go get a shower."

"Oh, right. Well, take care."

"Enjoy your dinner."

"Right-oh. 'Bye."

Voices from another universe. At that, Vorbarr Sultana was only a couple of hours away by sub-orbital flight. In theory. Miles was obscurely comforted, to be reminded that the whole planet hadn't shrunk to the lead-grey horizons of Kyril Island, even if his part of it seemed to have.

Miles found it difficult to concentrate on the weather, the rest of that day. Fortunately his superior didn't much notice. Since the scat-cat sinking Ahn had tended to maintain a guilty, nervous

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silence around Miles except when directly prodded for specific information. When his duty-day ended Miles headed straight for the infirmary.

The surgeon was still working, or at least sitting, at his desk console when Miles poked his head around the doorframe. "Good evening, sir."

The surgeon glanced up. "Yes, ensign? What is it?"

Miles took this as sufficient invitiation despite the unencouraging tone of voice, and slipped within. "I was wondering what you'd found out about that fellow we pulled from the culvert this morning."

The surgeon spread his hand, palm up. "Not that much to find out. His ID checked. He died of drowning. All the physical and metabolic evidence— stress, hypothermia, the hematomas—are consistent with his being stuck in there for a bit less than half an hour before death. I've ruled it death by misadventure."

"Yes, but why?"

"Why?" The surgeon's eyebrows rose. "He slabbed himself, you'll have to ask him, eh?"

"Don't you want to find out?"

"To what purpose?"

"Well . . . to know, I guess. To be sure you're right."

The surgeon gave him a dry stare. "I'm not questioning your medical findings, sir," Miles added hastily. "But it was just so damn weird. Aren't you curious?"

"Not any more," said the surgeon. "I'm satisfied it wasn't suicide or foul play, so whatever the details, it comes down to death from stupidity in the end, doesn't it?"

Miles wondered if that would have been the surgeon's final epitaph on him, if he'd sunk himself with the scat-cat. "I suppose so, sir."

Standing outside the infirmary afterward in the damp wind, Miles hesitated. The corpse, after all, was not Miles's personal property. Not a case of finders-keepers. He'd turned the situation over to the proper authority. It was out of his hands now. And yet . . .

There were still several hours of daylight left. Miles was having trouble sleeping anyway, in these almost-endless days. He returned to his quarters, pulled on sweat pants and shirt and running shoes, and went jogging.

The road was lonely, out by the empty practice fields. The sun crawled crabwise toward the horizon. Miles broke from a jog back to a walk, then to a slower walk. His leg-braces chafed, beneath his pants. One of these days very soon he would take the time to get the brittle long bones in his legs replaced with synthetics. At that, elective surgery might be a quasi-legitimate way to lever himself off Kyril Island, if things got too desperate before his six months were up. It seemed like cheating, though.

He looked around, trying to imagine his present surroundings in the dark and heavy rain. If he had been the private, slogging along this road about midnight, what would he have seen? What could possibly have attracted the man's attention to the ditch? Why the hell had he come out here in the middle of the night in the first place? This road wasn't on the way to anything but an obstacle course and a firing range.

There was the ditch. . . . no, his ditch was the next one, a little farther on. Four culverts pierced the raised

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roadway along this half-kilometer straight stretch. Miles found the correct ditch and leaned on the railing, staring down at the now-sluggish trickle of drain water. There was nothing attractive about it now, that was certain. Why, why, why . . . ?

Miles sloped along up the high side of the road, examining the road surface, the railing, the sodden brown bracken beyond. He came to the curve and turned back, studying the opposite side. He arrived back at the first ditch, on the base-ward end of the straight stretch, without discovering any view of charm or interest.

Miles perched on the railing and meditated. All right, time to try a little logic. What overwhelming emotion had led the private to wedge himself in the drain, despite the obvious danger? Rage? What had he been pursuing? Fear? What could have been pursuing him? Error? Miles knew all about error. What if the man had picked the wrong culvert . . . ?

Impulsively, Miles slithered down into the first ditch. Either the man had been methodically working his way through all the culverts—if so, had he been working from the base out, or from the practice fields back?—or else he had missed his intended target in the dark and rain and got into the wrong one. Miles would give them all a crawl-through if he had to, but he preferred to be right the first time. Even if there wasn't anybody watching. This culvert was slightly wider in diameter than the second, lethal one. Miles pulled his hand light from his belt, ducked within, and began examining it centimeter by centimeter.

"Ah," he breathed in satisfaction, midway beneath the road. There was his prize, stuck to the upper side of the culvert's arc with sagging tape. A package, wrapped in waterproof plastic. How *interesting*. He slithered out and sat in the mouth of the culvert, careless of the damp but carefully out of view from the road above.

He placed the packet on his lap and studied it with pleasurable anticipation, as if it had been a birthday present. Could it be drugs, contraband, classified documents, criminal cash? Personally, Miles hoped for classified documents, though it was hard to imagine anyone classifying anything on Kyril Island except maybe the efficiency reports. Drugs would be all right, but a spy ring would be just *wonderful*. He'd be a Security hero—his mind raced ahead, already plotting the next move in his covert investigation. Following the dead man's trail through subtle clues to some ringleader, who knew how high up? The dramatic arrests, maybe a commendation from Simon Illyan himself. . . . The package was lumpy, but crackled slightly—plastic flimsies?

Heart hammering, he eased it open—and slumped in stunned disappointment. A pained breath, half laugh, half moan, puffed from his lips.

Pastries. A couple of dozen lisettes, a kind of miniature popover glazed and stuffed with candied fruit, made, traditionally, for the midsummer day celebration. Month-and-a-half-old stale pastries. What a cause to die for. . . .

Miles's imagination, fueled by knowledge of barracks life, sketched in the rest readily enough. The private had received this package from some sweetheart, mother, sister, and sought to pro-

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tect it from ravenous mates, who would have wolfed it all down in seconds. Perhaps the man, starved for home, had been rationing them out to himself morsel by morsel in a lingering masochistic ritual, pleasure and pain mixed with each bite. Or maybe he'd just been saving them for some special occasion.

Then came the two days of unusually heavy rain, and the man had begun to fear for his secret treasure's, ah, liquidity margin. He'd come out to rescue his cache, missed the first ditch in the dark, gone at the second in desperate determination as the waters rose, realized his mistake too late. . . .

Sad. A little sickening. But not *useful*. Miles sighed, bundled the lisettes back up, and trotted off with the package under his arm, back to the base to turn it over to the surgeon.

The surgeon's only comment, when Miles caught up with him and explained his findings, was "Yep. Death from stupidity, all right." Absently, he bit into a lisette and sniffed.

Miles's time on maintenance detail ended the next day without his finding anything in the sewers of greater interest than the drowned man. It was probably just as well. The following day Ahn's office corporal arrived back from his long leave. Miles discovered that the corporal, who'd been working the weather office for some two years, was a ready reservoir of the greater part of the information Miles had spent the last two weeks busting his brains to learn. He didn't have Ahn's nose, though.

Ahn actually left Camp Permafrost sober, walking up the transport's ramp under his own power. Miles went to the shuttle pad to see him off, not certain if he was glad or sorry to see the weatherman go. Ahn looked happy, though, his lugubrious face almost illuminated.

"So where are you headed, once you turn in your uniforms?" Miles asked him.

"The equator."

"Ah? Where on the equator?"

"*Anywhere* on the equator," Ahn replied with fervor.

Miles trusted he'd at least pick a spot with a suitable land mass under it.

Ahn hesitated on the ramp, looking down at Miles. "Watch out for Metzov," he advised at last.

This warning seemed remarkably late, not to mention maddeningly vague. Miles gave Ahn an exasperated look, up from under his raised eyebrows. "I doubt I'll be much featured on his social calendar."

Ahn shifted uncomfortably. "That's not what I meant."

"What do you mean?"

"Well . . . I don't know. I once saw . . ."

"What?"

Ahn shook his head. "Nothing. It was a long time ago. A lot of crazy things were happening, at the height of the Komarr revolt. But it's better that you should stay out of his way."

"I've had to deal with old martinets before."

"Oh, he's not exactly a martinet. But he's got a streak of . . . he can be a funny kind of dangerous. Don't ever really threaten him, huh?"

"Me, threaten Metzov?" Miles's face screwed up in bafflement. Maybe Ahn wasn't as sober as he smelled after all. "Come on, he can't be that bad, or

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they'd never put him in charge of trainees."

"He doesn't command the grubs. They have their own hierarchy—comes in with 'em—the instructors report to their own commander. Metzov's just in charge of the base's permanent physical plant." Ahn paused. "You're a pushy little sod, Vorkosigan. Just don't . . . ever push him to the edge, or you'll be sorry. And that's all I'm going to say." Ahn shut his mouth determinedly, and headed up the ramp.

I'm already sorry, Miles thought of calling after him. Well, his punishment week was over now. Perhaps Metzov had meant the labor detail to humiliate Miles, but actually it had been quite interesting. Sinking his scat-cat, now, *that* had been humiliating. That he had done to *himself*. Miles waved one last time to Ahn as he disappeared into the transport shuttle, shrugged, and headed back across the tarmac toward the now-familiar admin building.

It took fully a couple of minutes, after Miles's corporal had left the weather office for lunch, for Miles to yield to the temptation to scratch the itch Ahn had planted in his mind, and punch up Metzov's public record on the comconsole. The mere listing of the base commander's dates, assignments, and promotions was not terribly informative, though a little knowledge of history filled in between the lines.

Metzov had entered the Service some thirty-five years ago. His most rapid promotions had occurred, not surprisingly, during the conqest of Komarr about twenty-five years ago. He had somehow mananged to end up on the correct side during Vordarian's Pretendership two decades past—picking the wrong side in that civil affray would have been Miles's first guess why such an apparently competent officer had ended up marking out his later years on ice on Kyril Island. But the dead halt to Metzov's career seemed to come during the Komarr Revolt, some sixteen years back now. No hint in this file as to why, but for a cross-reference to another file. An Imperial Security code, Miles recognized. Dead end there.

Or maybe not. Lips compressed thoughtfully, Miles punched through another code on his comconsole.

"Operations, Commodore Jollif's office," Ivan began formally as his face materialized over the comconsole vid plate, then, "Oh, hello, Miles. What's up?"

"I'm doing a little research. Thought you might help me out."

"I should have known you wouldn't call me at HQ just to be sociable. So what d'you want?"

"Ah . . . do you have the office to yourself, just at present?"

"Yeah, the old man's stuck in committee." Ivan's eyes narrowed in suspicion. "Why do you ask?"

Miles relaxed slightly. "I want you to pull a file for me." He reeled off the code-string.

Ivan's hand started to tap it out, then stopped. "Are you crazy? That's an Imperial Security file. No can do!"

"Of course you can, you're right there, aren't you?"

Ivan shook his head smugly. "Not any more. The whole ImpSec file system's been made super-secure. You can't transfer data out of it except through a coded filter-cable, which you

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must physically attach. Which I would have to sign for. Which I would have to explain why I wanted it and produce authorizatiton. You got an authorization for this? Ha. I thought not."

Miles frowned frustration. "Surely you can call it up on the internal system."

"On the internal system, yes. What I can't do is connect the internal system to any external system for a data dump. So you're out of luck."

"You got an internal system comconsole in that office?"

"Sure."

"So," said Miles impatiently, "call up the file, turn your desk around, and let the two vids talk to each other. You can do that, can't you?"

Ivan scratched his head. "Would that work?"

"Try it!" Miles drummed his fingers while Ivan dragged his desk around and fiddled with focus. The signal was degraded but readable. "There, I thought so. Scroll it up for me, would you?"

Fascinating, utterly fascinating. The file was a collection of secret reports from an ImpSec investigation into the mysterious death of a prisoner in Metzov's charge, a Komarran rebel who had killed his guard and had himself been killed while attempting to escape. When ImpSec had demanded the Komarran's body for an autopsy, Metzov had turned over cremated ashes and an apology; if only he had been told a few hours earlier the body was wanted, etc. The investigating officer hinted at charges of illegal torture—perhaps in revenge for the death of the guard?—but was unable to amass enough evidence to obtain authorization to fast-penta the Barrayaran witnesses, including a certain Tech-ensign Ahn. The investigating officer had lodged a formal protest of his superior officer's decision to close the case, and there it ended. Apparently. If there was any more to the story it existed only in Simon Illyan's remarkable head, a secret file Miles was not about to attempt to access. Or in his father's—Admiral Vorkosigan was obsessed with Komarr, his "perfect conquest" that had gone so wrong. And Metzov's career had stopped, literally, cold.

"Miles," Ivan interrupted for the fourth time, "I really don't think we should be doing this. This is slit-your-throat-before-reading stuff, here."

"If we shouldn't do it, we shouldn't be able to do it. You'd still have to have the cable for flash-downloading. No real spy would be dumb enough to sit there inside Imperial HQ by the hour and scroll stuff through by hand, waiting to be caught and shot."

"That does it." Ivan killed the Security file with a swat of his hand. The vid image wavered wildly as Ivan dragged his desk back around, followed by scrubbing noises as he frantically rubbed out the tracks in his carpet with his boot. "I didn't do this, you hear?"

"I didn't mean you. *We're* not spies." Miles subsided glumly. "Still . . . I suppose somebody ought to tell Illyan about the little hole they overlooked in his Security arrangements."

"Not me!"

"Why not you? Put it in as a brilliant theoretical suggestion. Maybe you'll earn a commendation. Don't tell 'em we actually did it, of course. Or maybe we were just testing your theory, eh?"

"You," said Ivan severely, "are ca-

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reer-poison. Never darken my vid-plate again. Except at home, of course."

Miles grinned, and permitted his cousin to escape. He sat a while in the office, watching the colorful weather holos flicker and change, and thinking about his base commander, and the kinds of accidents that could happen to defiant prisoners.

Well, it had all been very long ago. Metzov himself would probably be retiring in another five years, with his status as a double-twenty-years-man and a pension, to merge into the population of unpleasant old men. Not so much a problem to be solved as to be outlived, at least by Miles. His ultimate purpose at Lazkowski Base, Miles reminded himself, was to escape Lazkowski Base, silently as smoke. Metzov would be left behind in time.

In the next weeks Miles settled into a tolerable routine. For one thing, the grubs arrived. All five thousand of them. Miles's status rose on their shoulders, to that of almost-human. Lazkowski Base suffered its first real snow of the season as the days shortened, plus a mild wah-wah lasting half a day, both of which Miles managed to predict accurately in advance.

Even more happily, Miles was completely displaced as the most famous idiot on the island (an unwelcome notoriety earned by the scat-cat sinking) by a group of grubs who managed one night to set their barracks on fire while lighting fart-flares. Miles's strategic suggestion at the officers' fire-safety meeting next day that they tackle the problem with a logistical assault on the enemy's fuel supply, i.e., eliminate red bean stew from the menu, was shot down with one icy glower from General Metzov, though in the hallway later, an earnest captain from Ordnance stopped Miles to thank him for trying.

So much for the glamour of the Imperial Service. Miles took to spending long hours alone in the weather office, studying chaos theory, his readouts, and the walls. Three months down, three to go. It was getting darker.

Miles was out of bed and half dressed before it penetrated his sleep-stunned brain that the galvanizing klaxon was not the wah-wah warning. He paused with a boot in his hand. Not fire or enemy attack, either. Not his department, then, whatever it was. The rhythmic blatting stopped. They were right, silence was golden.

He checked the glowing digital clock. It claimed mid-evening. He'd only been asleep about two hours, having fallen into bed exhausted after a long trip upisland in a snowstorm to repair wind damage to Weather Station Eleven. The comm link by his bed was not blinking its red call light to inform him of any surprise duties he must carry out. He could go back to bed.

Silence was *baffling*.

He pulled on the second boot and stuck his head out his door. A couple of other officers had done the same, and were speculating to each other on the cause of the alarm. Lieutenant Bonn emerged from his quarters and strode down the hall, jerking on his parka. His face looked strained, half worry, half annoyance.

Miles grabbed his own parka and galloped after him. "You need a hand, Lieutenant?"

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Bonn glanced down at him, and pursed his lips. "I might," he allowed.

Miles fell in beside him, secretly pleased by Bonn's implicit judgment that he might in fact be useful. "So what's up?"

"Some sort of accident in a toxic stores bunker. If it's the one I think, we could have a real problem."

They exited the double-doored heat-retaining vestibule from the officers' quarters into a night gone crystal cold. Fine snow squeaked under Miles's boots and swept along the ground in a faint east wind. The brightest stars overhead held their own against the base's lights. The two men slid into Bonn's scat-cat, their breath smoking until the canopy-defrost cut in. Bonn headed west out of the base at high acceleration.

A few kilometers past the last practice fields, a row of turf-topped barrows hunched in the snow. A cluster of vehicles were parked at the end of one bunker—a couple of scat-cats, including the one belonging to the base fire marshal, and medical transport. Handlights moved among them. Bonn slewed in and pulled up, and popped his door. Miles followed him, crunching rapidly across the packed ice.

The surgeon was directing a pair of corpsmen, who were loading a foil-blanketed shape and a second coverall-clad soldier who shivered and coughed onto the med transport. "All of you, put everything you're wearing into the destruct bin when you hit the door," he called after them. "Blankets, bedding, splints, everything. Full decontamination showers for you all before you even start to worry about that broken leg of his. The pain-killer will hold him through it, and if it doesn't, ignore the screams and keep scrubbing. I'll be right behind you." The surgeon shuddered, turning away, whistling dismay through his teeth.

Bonn headed for the bunker door. "Don't open that!" the surgeon and the fire marshal called together. "There's nobody left inside," the surgeon added. "All evacuated now."

"What exactly happened?" Bonn scrubbed with a gloved hand at the frosted window set in the door, in an effort to see inside.

"Couple of guys were moving stores, to make room for a new shipment coming in tomorrow," the fire marshal, a lieutenant named Yaski, filled him in rapidly. "They dumped their loader over, one got pinned underneath with a broken leg."

"That . . . took ingenuity," said Bonn, obviously picturing the mechanics of the loader in his mind.

"They had to have been horsing around," said the surgeon impatiently. "But that's not the worst of it. They took several barrels of fetaine over with them. And at least two broke open. The stuff's all over the place in there. We've sealed the bunker as best we could. Clean-up," the surgeon exhaled, "is your problem. I'm gone." He looked like he wanted to crawl out of his own skin, as well as his clothes. He waved, making quickly for his scat-cat to follow his corpsmen and their patients through medical decontamination.

"Fetaine!" Miles exclaimed in startlement. Bonn had retreated hastily from the door. Fetaine was a mutagenic poison invented as a terror weapon but never, so far as Miles knew, used in

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combat. "I thought that stuff was obsolete. Off the menu." His academy course in Chemicals and Biologicals had barely mentioned it.

"It is obsolete," said Bonn grimly. "They haven't made any in twenty years. For all I know this is the last stockpile on Barrayar. Dammit, those storage barrels shouldn't have broken open even if you'd dropped 'em out a shuttle."

"Those storage barrels are at least twenty years old, then," the marshal pointed out. "Corrosion?"

"In that case," Bonn craned his neck, "what about the rest of them?"

"Exactly," nodded Yaski.

"Isn't fetaine destroyed by heat?" Miles asked nervously, checking to make sure they were standing around discussing this *up*wind of the bunker. "Chemically dissociated into harmless components, I heard."

"Well, not exactly harmless," said Lieutenant Yaski. "But at least they don't unravel all the DNA in your balls."

"Are there any explosives stored in there, Lieutenant Bonn?" Miles asked.

"No, only the fetaine."

"If you tossed a couple of plasma mines through the door, would the fetaine all be chemically cracked before the roof melted in?"

"You wouldn't want the roof to melt in. Or the floor. If that stuff ever got loose in the permafrost . . . But if you set the mines on slow heat release, and threw a few kilos of neutral plas-seal pellets in with 'em, the bunker might be self-sealing." Bonn's lips moved in silent calculation. ". . . Yeah, that'd work. In fact, that could be the safest way to deal with that crap. Particularly if the rest of the barrels are starting to lose integrity too."

"Depending on which way the wind is blowing," put in Lieutenant Yaski, looking back toward the base and then at Miles.

"We're expecting a light east wind with dropping temperatures till about 0700 tomorrow morning," Miles answered his look. "Then it'll shift around to the north and blow harder. Potential wah-wah conditions starting around 1800 tomorrow night."

"If we're going to do it that way, we'd better do it tonight, then," said Yaski.

"All right," said Bonn decisively. "I'll round up my crew, you round up yours. I'll pull the plans for the bunker, calculate the charges' release-rate, and meet you and the ordnance chief in Admin in an hour."

Bonn posted the fire marshal's sergeant as guard to keep everyone well away from the bunker. An unenviable duty, but not unbearable in present conditions, and the guard could retreat inside, his scat-cat when the temperature dropped, toward midnight. Miles rode back with Bonn to the base Administration building to double-check his promises about wind direction at the weather office.

Miles ran the latest data through the weather computers, that he might present Bonn with the most refined possible update on predicted wind vectors over the next 26.7 hour Barrayaran day. But before he had the printout in his hand, he saw Bonn and Yaski out the window, down below, hurrying away from the

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Admin building into the dark. Perhaps they were meeting with the ordnance chief elsewhere? Miles considered chasing after them, but the new prediction was not significantly different from the older one. Did he really need to go watch them cauterize the poison dump? It could be interesting—educational. On the other hand, he had no real function there now. As his parents' only child—as the father, perhaps, of some future Count Vorkosigan it was arguable if he even had the right to expose himself to such a vile mutagenic hazard for mere curiosity. There seemed no immediate danger to the base—till the wind shifted, anyway. Or was cowardice masquerading as logic? Prudence was a virtue, he had heard.

Now thoroughly awake, and too rattled to even imagine re-capturing sleep, he pottered around the weather office, and caught up on all the routine files he had set aside that morning in favor of the repairs junket. An hour of steady plugging finished off everything that even remotely looked like work. When he found himself compulsively dusting equipment and shelves, he decided it was time to go back to bed, sleep or no sleep. But a shifting light from the window caught his eye, a scat-cat pulling up out front.

Ah, Bonn and Yaski, back. Already? That had been fast, or hadn't they started yet? Miles tore off the plastic flimsy with the new wind readout and headed downstairs to the Base Engineering office at the end of the corridor.

Bonn's office was dark. But light spilled into the corridor from the Base Commander's office. Light, and angry voices rising and falling. Clutching the flimsy, Miles approached.

The door was open to the inner office. Metzov sat at his desk console, one clenched fist resting on the flickering colored surface. Bonn and Yaski stood tensely before him. Miles rattled the flimsy cautiously to announce his presence.

Yaski's head swiveled around, and his gaze caught Miles. "Send Vorkosigan, he's a mutant already, isn't he?"

Miles gave a vaguely directed salute and said immediately, "Pardon me, sir, but no, I'm not. My last encounter with a military poison did teratogenic damage, not genetic. My future children should be as healthy as the next man's. Ah, send me where, sir?"

Metzov glowered across at Miles, but did not pursue Yaski's unsettling suggestion. Miles handed the flimsy wordlessly to Bonn, who glanced at it, grimaced, and stuffed it savagely into his trouser pocket.

"Of *course* I intended them to wear protective gear," continued Metzov to Bonn in irritation. "I'm not mad."

"I understood that, sir. But the men refuse to enter the bunker even with contamination gear," Bonn reported in a flat, steady voice. "I can't blame them. The standard precautions are inadequate for fetaine, in my estimation. The stuff has an incredibly high penetration value, for its molecular weight. Goes right through permeables."

"You can't *blame* them?" repeated Metzov in astonishment. "Lieutenant, you gave an order. Or you were supposed to."

"I did, sir, but—"

"But—you let them sense your own

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indecision. Your weakness. Dammit, when you give an order you have to give it, not dance around it."

"Why do we have to save this stuff?" said Yaski plaintively.

"We've been over that. It's our charge," Metzov grunted at him. "Our orders. You can't ask a man to give an obedience you don't give yourself."

What, blind? "Surely Research still has the recipe," Miles put in, feeling he was at last getting the alarming drift of this argument. "They can mix up more if they really want it. Fresh."

"Shut up, Vorkosigan," Bonn growled desperately out of the corner of his mouth, as General Metzov snapped, "Open your lip tonight with one more sample of your humor, Ensign, and I'll put you on charges."

Miles's lips closed over his teeth in a tight glassy smile. Subordination. The *Prince Serg*, he reminded himself. Metzov could go drink the fetaine, for all Miles cared, and it would be no skin off his nose. His clean nose, remember?

"Have you never heard of the fine old battlefield practice of shooting the man who disobeys your order, Lieutenant?" Metzov went on to Bonn.

"I . . . don't think I can make that threat, sir," said Bonn stiffly.

And besides, thought Miles, *we're not on a battlefield. Are we?*

"Techs!" said Metzov in a tone of disgust. "I didn't say threaten, I said shoot. Make one example, the rest will fall in line."

Miles decided he didn't much care for Metzov's brand of humor, either. Or was the general speaking literally?

"Sir, fetaine is a violent mutagen," said Bonn doggedly. "I'm not at all sure the rest *would* fall into line, no matter what the threat. It's a pretty unreasonable topic. I'm . . . a little unreasonable about it myself."

"So I see." Metzov stared at him coldly. His glare passed on to Yaski, who swallowed and stood straighter, his spine offering no concession. Miles tried to cultivate invisibility.

"If you're going to go on pretending to be military officers, you techs need a lesson in how to extract obedience from your men," Metzov decided. "Both of you go and assemble your crews in front of Admin in twenty minutes. We're going to have a little old-fashioned discipline parade."

"You're not—seriously thinking of shooting anyone, are you?" said Lieutenant Yaski in alarm.

Metzov smiled sourly. "I doubt I'll have to." He regarded Miles. "What's the outside temperature right now, Weather Officer?"

"Five degrees of frost, sir," replied Miles, careful now to speak only when spoken to.

"And the wind?"

"Winds from the east at nine kilometers per hour, sir."

"Very good." Metzov's eye gleamed wolfishly. "Dismissed, gentlemen. See if you can carry out your orders, this time."

General Metzov stood, heavily gloved and parka-bundled, beside the empty metal banner pole in front of Admin, and stared down the half-lit road. Looking for what? Miles wondered. It was pushing midnight now. Yaski and Bonn were lining up their tech crews in parade

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array, some fifteen thermal-coveralled and parka-clad men.

Miles shivered, and not just from the cold. Metzov's seamed face looked angry. And tired. And old. And scary. He reminded Miles a bit of his grandfather on a bad day. Though Metzov was in fact younger than Miles's father; Miles had been a child of his father's middle-age, some generational skew there. His grandfather, the old General Count Piotr himself, had sometimes seemed a refugee from another century. Now, the really old-fashioned discipline parades had involved lead-lined rubber hoses. How far back in Barrayaran history was Metzov's mind rooted?

Metzov smiled, a gloss over rage, and turned his head at a movement down the road. In a horribly cordial voice he confided to Miles, "You know, Ensign, there was a secret behind that carefully-cultivated inter-service rivalry they had back on Old Earth. In the event of a mutiny you could always persuade the army to shoot the navy, or vice versa, when they could no longer discipline themselves. A hidden disadvantage to a combined Service like ours."

"Mutiny!" said Miles, startled out of his resolve to speak only when spoken to. "I thought the issue was poison exposure."

"It *was*. Unfortunately, due to Bonn's mishandling, it's now a matter of principle." A muscle jumped in Metzov's jaw. "It had to happen sometime, in the New Service. The Soft Service."

Typical Old Service talk, that, old men bullshitting each other about how tough they'd had it in the old days. "Principle, sir, what principle? It's *waste disposal*," Miles choked.

"It's a mass refusal to obey a direct order, Ensign. Mutiny by any barracks-lawyer's definition. Fortunately, this sort of thing is easy to dislocate, if you move quickly, while it's still small and confused."

The motion down the road resolved itself into a platoon of grubs in their winter-white camouflage gear, marching under the direction of a Base sergeant. Miles recognized the sergeant as part of Metzov's personal power-net, an old veteran who'd served under Metzov as far back as the Komarr Revolt, and who had moved on with his master.

The grubs, Miles saw, had been armed with lethal nerve-disruptors, which were purely anti-personnel hand weapons. For all the time they spent learning about such things, the opportunity for even advanced trainees such as these to lay hands on fully powered deadly weapons was rare, and Miles could sense their nervous excitement from here.

The sergeant lined the grubs up in a cross-fire array around the stiff-standing techs, and barked an order. They presented their weapons, and aimed them, the silver bell-muzzles gleaming in the scattered light from the Admin building. A twitchy ripple ran through Bonn's men. Bonn's face was ghastly white, his eyes glittering like jet.

"Strip," Metzov ordered through set teeth.

Disbelief, confusion; only one or two of the techs grasped what was being demanded, and began to undress. The others, with many uncertain glances around, belatedly followed suit.

"When you are again ready to obey your orders," Metzov continued in a

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parade-pitched voice that carried to every man, "you may dress and go to work. It's up to you." He stepped back, nodded to his sergeant, and took up a pose of parade rest. "That'll cool 'em off," he muttered to himself, barely loud enough for Miles to catch. Metzov looked like he fully expected to be out here no more than five minutes; he looked like he was already thinking of warm quarters and a hot drink.

Olney and Pattas were among the techs, Miles noted, along with most of the rest of the Greek-speaking cadre who had plagued Miles early on. Others Miles had seen around, or talked to during his private investigation into the background of the drowned man, or barely knew. Fifteen naked men starting to shiver violently as the dry snow whispered around their ankles. Fifteen bewildered faces beginning to look terrified. Eyes shifted toward the nerve-disruptors trained on them. *Give in*, Miles urged silently. *It's not worth it.* But more than one pair of eyes flickered at him, and squeezed shut in resolution.

Miles silently cursed the anonymous clever boffin who'd invented fetaine as a terror weapon, not for his chemistry, but for his insight into the Barrayaran psyche. Fetaine could surely never have been used, could never be used. Any faction trying to do so must rise up against itself and tear apart in moral convulsions.

Yaski, standing back from his men, looked thoroughly horrified. Bonn, his expression black and brittle as obsidian, began to strip off his gloves and parka.

No, no, no! Miles screamed inside his head. *If you join them they'll never back down. They'll know they're right:* Bad mistake, bad . . . Bonn dropped the rest of his clothes in a pile, marched forward, joined the line, wheeled, and locked eyes with Metzov. Metzov's eyes narrowed with new fury. "So," he hissed, "you convict yourself. Freeze, then."

How had things gone so bad, so fast? Now would be a good time to remember a duty in the weather office, and get the hell out of here. If only those shivering bastards would back down, Miles could get through this night without a ripple in his record. He had no duty, no function here. . . .

Metzov's eye fell on Miles. "Vorkosigan, you can either take up a weapon and be useful, or consider yourself dismissed."

He could leave. Could he leave? When he made no move, the sergeant walked over and thrust a nerve disruptor into Miles's hand. Miles took it up, still struggling to think with brains gone suddenly porridge. He did retain the wit to make sure the safety was "on" before pointing the disruptor vaguely in the direction of the freezing men.

This isn't going to be a mutiny. It's going to be a massacre.

One of the armed grubs giggled nervously. What had they been told they were doing? What did they *believe* they were doing? Eighteen, nineteen-year-olds—could they even recognize a criminal order? Or know what to do about it if they did?

Could Miles?

The situation was ambiguous, that was the problem. It didn't quite fit. Miles knew about criminal orders, every academy man did. His father came down personally and gave a one-day

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seminar on the topic to the seniors at mid-year. He'd made it a requirement to graduate, by Imperial fiat back when he'd been Regent. What exactly constituted a criminal order, when and how to disobey it. With vid evidence from various historical test cases and bad examples, including the politically disastrous Solstice Massacre that had taken place under the Admiral's own command. Invariably one or more cadets had to leave the room to throw up during that part.

The other instructors hated Vorkosigan's Day. Their classes were subtly disrupted for weeks afterward. One reason Admiral Vorkosigan didn't wait till any later in the year. He almost always had to make a return trip a few weeks after, to talk some disturbed cadet out of dropping out at almost the finale of his schooling. Only the academy cadets got this live lecture, as far as Miles knew, though his father talked of canning it on holovid and making it a part of basic training Service-wide. Parts of the seminar had been a revelation even to Miles.

But this . . . If the techs had been civilians, Metzov would clearly be in the wrong. If this had been in wartime, while being harried by some enemy, Metzov might be within his rights, even duty. This was somewhere between. Soldiers disobeying, but passively. Not an enemy in sight. Not even a physical situation threatening, necessarily, lives on the base (except theirs), though when the wind shifted that could change. *I'm not ready for this, not yet, not so soon. My career . . .*

Claustrophobic panic rose in Miles's chest, like a man with his head caught in a drain. The nerve disruptor wavered just slightly in his hand. Over the parabolic reflector he could see Bonn standing dumbly, too congealed now even to argue any more. Ears were turning white out there, and fingers and feet. One man crumpled into a shuddering ball, but made no move to surrender. Was there any softening of doubt yet, in Metzov's rigid neck?

For a lunatic moment Miles envisioned thumbing off the safety and shooting Metzov. And then what, shoot the grubs? He couldn't possibly get them all before they got him.

I could be the only soldier here under thirty who's ever killed an enemy before, in battle or out of it. The grubs might fire out of ignorance, or sheer curiosity. They didn't know enough *not* to. *What we do in the next half-hour will replay in our heads as long as we breathe.*

He could try doing nothing. Only follow orders. How much trouble could he get into, only following orders? Every commander he'd ever had agreed, he needed to follow orders better. *Think you'll enjoy your ship duty, then, Ensign Vorkosigan, you and your pack of frozen ghosts? At least you'd never be lonely. . . .*

Miles, still holding up the nerve disruptor, faded backward, out of the grubs' line-of-sight, out of the corner of Metzov's eye. Tears stung and blurred his vision. From the cold, no doubt.

He sat on the ground. Pulled off his gloves and boots. Let his parka fall, and his shirts. Trousers and thermal underwear atop the pile, and the nerve-disruptor nested carefully on them. He

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stepped forward. His leg braces felt like icicles against his calves.

I hate passive resistance. I really, really hate it.

"What the hell do you think *you're* doing, Ensign?" Metzov snarled as Miles limped past him.

"Breaking this up, sir," Miles replied steadily. Even now some of the shivering techs flinched away from him, as if his deformities might be contagious. Pattas didn't draw away, though. Nor Bonn.

"Bonn tried that bluff. He's now regretting it. It won't work for you either, Vorkosigan." Metzov's voice shook too, though not from the cold.

You should have said "Ensign." What's in a name? Miles could see the ripple of dismay run through the grubs, that time. No, this hadn't worked for Bonn. Miles might be the only man here for whom this sort of individual intervention could work. Depending on how far gone Mad Metzov was by now.

Miles spoke now for both Metzov's benefit and the grubs'. "It's possible —barely—that Service Security wouldn't investigate the deaths of Lieutenant Bonn and his men, if you diddled the record, claimed some accident. I guarantee Imperial Security will investigate *mine*."

Metzov grinned strangely. "Suppose no witnesses survive to complain?"

Metzov's sergeant looked as rigid as his master. Miles thought of Ahn, drunken Ahn, silent Ahn. What had Ahn seen, once long ago, when crazy things were happening on Komarr? What kind of surviving witness had he been? A guilty one, perhaps? "S-s-sorry, sir, but I see at least ten witnesses, behind those nerve disruptors." Silver parabolas — they looked enormous, like serving dishes, from this new angle. The change in point of view was amazingly clarifying. No ambiguities now.

Miles continued, "Or do you propose to execute your firing squad and then shoot yourself? Imperial Security will fast-penta everyone in sight. You can't silence me. Living or dead, through my mouth or yours—or theirs—I will testify." Shivers racked Miles's body. Astonishing, the effect of just that little bit of east wind, at this temperature. He fought to keep the shakes out of his voice, lest cold be mistaken for fear.

"Small consolation, if you—ah — permit yourself to freeze, I'd say, Ensign." Metzov's heavy sarcasm grated on Miles's nerves. The man still thought he was winning. Insane.

Miles's bare feet felt strangely warm, now. His eyelashes were crunchy with ice. He was catching up fast to the others, in terms of freezing to death, no doubt because of his smaller mass. His body was turning a blotchy purple-blue.

The snow-blanketed base was so silent. He could almost hear the individual snow grains skitter across the sheet ice. He could hear the vibrating bones of each man around him, pick out the hollow frightened breathing of the grubs. Time stretched.

He could threaten Metzov, break up his complacency with dark hints about Komarr, *the truth will out. . . .* He could call on his father's rank and position. He could . . . dammit, Metzov must realize he was overextended, no matter how mad he was. His discipline parade bluff hadn't worked and now he was stuck with it, stonily defending his

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authority unto death. *He can be a funny kind of dangerous, if you really threaten him.* . . . It was hard to see through the sadism to the underlying fear. But it had to be there, underneath. . . . Pushing wasn't working. Metzov was practically petrified with resistance. What about pulling . . .?

"But consider, sir," Miles's words stuttered out persuasively, "the advantages to yourself of stopping now. You now have clear evidence of a mutinous, er, conspiracy. You can arrest us all, throw us in the stockade. It's a better revenge, 'cause you get it all and lose nothing. I lose my career, get a dishonorable discharge or maybe prison—do you think I wouldn't rather die? Service Security punishes the rest of us for you: You get it all."

Miles's words had hooked him; Miles could see it, in the red glow fading from the narrowed eyes, in the slight bending of that stiff, stiff neck. Miles had only to let the line out, refrain from jerking on it and renewing Metzov's fighting frenzy, *wait*. . . .

Metzov stepped nearer, bulking in the half-light, haloed by his freezing breath. His voice dropped, pitched to Miles's ear alone. "A typical soft Vorkosigan answer. Your father was soft on Komarran scum. Cost us lives. A court-martial for the Admiral's little boy—that might bring down that holier-than-thou buggerer, eh?"

Miles swallowed icy spit. *Those who do not know their history,* his thought careened, *are doomed to keep stepping in it.* Alas, so were those who did, it seemed. "Thermo the damned fetaine spill," he whispered hoarsely, "and see."

Lieutenant Yaski had taken the opportunity afforded by Miles's attention-arresting nude arrival on center stage to quietly disappear into the Admin building and make several frantic calls. But by the time the trainee's commander, the base surgeon, and Metzov's second-in-command arrived, primed to persuade or perhaps sedate and confine Metzov, the decision had been made. Miles, Bonn, and the techs were already dressed and being marched, stumbling, toward the stockade bunker under the argus-eyes of the nerve disruptors.

"Am I s-supposed to th-thank you for this?" Bonn asked Miles through chattering teeth. Their hands and feet swung like paralyzed lumps; he leaned on Miles, Miles hung on him, hobbling down the road together.

"We got what we wanted, eh? He's going to plasma the fetaine on-site before the wind shifts in the morning. Nobody dies. Nobody gets their nuts curdled. We win. I think." Miles emitted a deathly cackle through numb lips.

"I never thought," wheezed Bonn, "that I'd ever meet anybody crazier than Metzov."

"I didn't do anything you didn't," protested Miles. "Except I made it work. Sort of. It'll all-look different in the morning, anyway."

"Yeah. Worse," Bonn predicted glumly.

Miles jerked up out of an uneasy doze on his cell cot when the door hissed open. They were bringing Bonn back.

Miles rubbed his unshaven face. "What time is it out there, lieutenant?"

"Dawn." Bonn looked as pale, stubbled, and criminally low as Miles felt.

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He eased himself down on his cot with a pained grunt.

"What's happening?"

"Service Security's all over the place. They flew in a captain from the mainland, just arrived, who seems to be in charge. Metzov's been filling his ear, I think. They're just taking depositions, so far."

"They get the fetaine taken care of?"

"Yep." Bonn vented a grim snicker. "They just had me out to check it, and sign the job off. The bunker made a neat little oven, all right."

"Ensign Vorkosigan, you're wanted," said the security guard who'd delivered Bonn. "Come with me now."

Miles creaked to his feet and limped toward the cell door. "See you later, lieutenant."

"Right. If you spot anybody out there with breakfast, why don't you use your political influence to send 'em my way, eh?"

Miles grinned bleakly. "I'll try."

Miles followed the guard up the stockade's short corridor. Lazkowski Base's stockade was not exactly what one would call a high-security facility, being scarcely more than a living quarters bunker with doors that only locked from the outside and no windows. The weather usually made a better guard than any force screen, not to mention the 500-kilometer-wide ice water moat surrounding the island.

The base security office was busy this morning. Two grim strangers stood waiting by the door, a lieutenant and a big sergeant with the Horus-eye insignia of Imperial Security on their sleek uniforms. *Imperial* Security, not Service Security. Miles's very own Security, who had guarded his family all his father's political life. Miles regarded them with possessive delight.

The base security clerk looked harried, his desk console lit up and blinking. "Ensign Vorkosigan, sir, I need your palm print on this."

"All right. What am I signing?"

"Just the travel orders, sir."

"What? Ah . . ." Miles paused, holding up his plastic-mitted hands. "Which one?"

"The right, I guess would do, sir."

With difficulty, Miles peeled off the right mitten with his awkward left. His hand glistened with the medical gel that was supposed to be healing the frostbite. His hand was swollen, red-blotched and mangled-looking, but the stuff must be working. All his fingers now wriggled. It took three tries, pressing down on the ID pad, before the computer recognized him.

"Now yours, sir," the clerk nodded to the Imperial Security lieutenant. The ImpSec man laid his hand on the pad and the computer bleeped approval. He lifted it and glanced dubiously at the sticky sheen, looked around futilely for some towel, and wiped it surreptitiously on his trouser seam just behind his stunner holster. The clerk dabbed nervously at the pad with his uniform sleeve, and touched his intercom.

"Am I glad to see you fellows," Miles told the ImpSec officer. "Wish you'd been here last night."

The lieutenant did not smile in return. "I'm just a courier, Ensign. I'm not supposed to discuss your case."

General Metzov ducked through the door from the inner office, a sheaf of plastic flimsies in one hand and a Serv-

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ice Security captain at his elbow, who nodded warily to his counterpart on the Imperial side.

The general was almost smiling. "Good morning, Ensign Vorkosigan." His glance took in Imperial Security without dismay. Dammit, ImpSec should be making that near-murderer shake in his combat boots. "It seems there's a wrinkle in this case even I hadn't realized. When a Vor lord involves himself in a military mutiny, a charge of high treason follows automatically."

"What?" Miles swallowed, to bring his voice back down. "Lieutenant, I'm not under arrest by *Imperial* Security, am I?"

The lieutenant produced a set of handcuffs and proceeded to attach Miles to the big sergeant. *Overholt*, read the name on the man's badge, which Miles mentally redubbed Overkill. He had only to lift his arm to dangle Miles like a kitten.

"You are being detained, pending further investigation," said the lieutenant formally.

"How long?"

"Indefinitely."

The lieutenant headed for the door, the sergeant and perforce Miles following. "Where?" Miles asked frantically.

"Imperial Security Headquarters."

Vorbarr Sultana! "I need to get my things—"

"Your quarters have already been cleared."

"Will I be coming back here?"

"I don't know, ensign."

Late dawn was streaking Camp Permafrost with grey and yellow when the scat-cat deposited them at the shuttlepad. The Imperial Security sub-orbital courier shuttle sat on the icy concrete like a bird of prey accidently placed in a pigeon cote. Slick and black and deadly, it seemed to break the sound barrier just resting there. Its pilot was at the ready, engines primed for takeoff.

Miles shuffled awkwardly up the ramp after Sergeant Overkill, the handcuff jerking coldly on his wrist. Tiny ice crystals danced in the northeasterly wind. The temperature would be stabilizing this morning, he could tell by the particular dry bite of the relative humidity in his sinuses. Dear God, it was past time to get off this island.

Miles took one last sharp breath, then the shuttle door sealed behind them with a snaky hiss. Within was a thick, upholstered silence that even the howl of the engines scarcely penetrated.

At least it was warm.

Autumn in the city of Vorbarr Sultana was a beautiful time of year, and today was exemplary. The air was high and blue, the temperature cool and perfect, and even the tang of industrial haze smelled good. The autumn flowers were not yet frosted off, but the Earth-import trees had turned their colors. Miles glimpsed one such tree as he was hustled out of the Security lift van and into a back entrance to the big blocky building that was Imperial Security Headquarters. An Earth maple, with carnelian leaves and a silver-grey trunk, across the street. Then the door closed. Miles held that tree before his mind's eye, trying to memorize it, just in case he never saw another.

The Security lieutenant produced passes that sped Miles and Overholt through the door guards, and led them

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into a maze of corridors to a pair of lift tubes. They entered the up tube, not the down one. So, Miles was not being taken directly to the ultra-secure cell block beneath the building. Miles woke to what this meant, and wished wistfully for the down tube.

They were ushered into an office on an upper level, past a Security captain, then into an inner office. A man, slight, bland, civilian-clothed, with brown hair greying at the temples, sat at his very large comconsole desk, studying a vid. He glanced up at Miles's escort. "Thank you, lieutenant, sergeant. You may go."

Overholt detached Miles from his wrist as the lieutenant asked, "Uh, will you be safe, sir?"

"I expect so," said the man dryly.

Yeah, but what about me? Miles wailed inwardly. The two soldiers exited, and left Miles alone, standing literally on the carpet. Unwashed, unshaven, still wearing the faintly reeking black fatigues he'd flung on—only last night? Face weather-raked, with his swollen hands and feet still encased in their plastic medical mittens—his toes now wriggled in their squishy matrix. No boots. He had dozed, in a jerky intermittent exhaustion, on the two-hour shuttle flight, without being noticeably refreshed. His throat was raw, his sinuses felt stuffed with packing fiber, and his chest hurt when he breathed.

Simon Illyan, Chief of Barrayaran Imperial Security, crossed his arms and looked Miles over slowly, from head to toe and back again. It gave Miles a skewed sense of *deja vu*.

Practically everyone on Barrayar feared this man's name, though few knew his face. This effect was carefully cultivated by Illyan, building in part—but only in part—on the legacy of his formidable predecessor, the legendary Security Chief Negri. Illyan and his department in turn had provided security for Miles's father for the twenty years of his political career, and had slipped up only once, during the night of the infamous soltoxin attack. Offhand, Miles knew of no one Illyan feared except Miles's mother. He'd once asked his father if this was guilt about the soltoxin, but Count Vorkosigan had replied, No, it was only the lasting effect of vivid first impressions. Miles had called Illyan "Uncle Simon" all his life until he'd entered the Service, "Sir" after that.

Looking at Illyan's face now, Miles thought he finally grasped the distinction between exasperation, and utter exasperation.

Illyan finished his inspection, shook his head, and groaned, "Wonderful. Just wonderful."

Miles cleared his throat. "Am I . . . really under arrest, sir?"

"That is what this interview will determine," Illyan sighed, leaning back in his chair. "I have been up since two hours after midnight over this escapade. Rumors are flying all over the Service, as fast as the vid net can carry them. The facts appear to be mutating every forty minutes, like bacteria. I don't suppose you could have picked some more public way to self-destruct? Attempted to assassinate the Emperor with your pocket-knife during the Birthday Review, say, or raped a sheep in the Great Square during rush hour?" The sarcasm melted to genuine pain. "He had so

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much hope of you. How could you betray him so?"

No need to ask who "he" was. *The* Vorkosigan. "I . . . don't think I did, sir. I don't know."

A light blinked on Illyan's comconsole. He exhaled, with a sharp glance at Miles, and touched a control. The second door to his office, in the wall to the right of his desk, slid open, and two men in dress greens ducked through.

Prime Minister Admiral Count Aral Vorkosigan wore the uniform as naturally as an animal wears its fur. He was a man of no more than middle height, stocky, grey-haired, heavy-jawed, scarred, almost a thug's body and yet with the most penetrating grey eyes Miles had ever encountered. He was flanked by his aide, a tall blond lieutenant named Jole. Miles had met Jole on his last home leave. Now, there was a perfect officer, brave and brilliant —he'd served in space, been decorated for some courage and quick thinking during a horrendous on-board accident, been rotated through HQ while recovering from his injuries, and promptly been snapped up as his military liaison by the Prime Minister, who had a sharp eye for hot new talent. Jaw-dropping gorgeous, to boot, he ought to be making recruiting vids. Miles sighed in hopeless jealousy every time he ran across him; Jole was even worse than Ivan, who while darkly handsome had never been accused of brilliance.

"Thanks, Jole," Count Vorkosigan murmured to his aide, as his eye found Miles. "I'll see you back at the office."

"Yes, sir." So dismissed, Jole ducked back out, glancing back at Miles and his superior with worried eyes, and the door hissed closed again.

Illyan still had his hand pressed to a control on his desk. "Are you officially here?" he asked Count Vorkosigan.

"No."

Illyan keyed something off—recording equipment, Miles realized. "Very well," he said, editorial doubt injected into his tone.

Miles saluted his father. His father ignored the salute and embraced him gravely, wordlessly, sat in the room's only other chair, crossed his arms and booted ankles, and said, "Continue, Simon."

Illyan, who had been cut off in the middle of what had been shaping up, in Miles's estimation, to a really classic reaming, chewed his lip in frustration. "Rumors aside," Illyan said to Miles. "what really happened last night out on that damned island?"

In the most neutral and succinct terms he could muster, Miles described the previous night's events, starting with the fetaine spill and ending with his arrest/detainment/to-be-determined by Imperial Security. His father said nothing during the whole recitation, but he had a light pen in his hand which he kept *turning* absently around and over, *tap* against his knee, around and over.

Silence fell when Miles finished. The light pen was driving Miles to distraction. He wished his father would put the damned thing away, or drop it, or anything.

His father slipped the light pen back into his breast pocket, thank God, leaned back, and steepled his fingers, frowning. "Let me get this straight. You say Metzov hopscotched the com-

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mand chain and dragooned *trainees* for his firing squad?"

"Ten of them. I don't know if they were volunteers or not, I wasn't there for that part."

"Trainees." Count Vorkosigan's face was dark. "Boys."

"He was babbling something about it being like the army versus the navy, back on Old Earth."

"Huh?" said Illyan.

"I don't think Metzov was any too stable when he was exiled to Kyril Island after his troubles in the Komarr Revolt, and fifteen years of brooding about it didn't improve his grip." Miles hesitated. "Will . . . General Metzov be questioned about his actions at all, sir?"

"General Metzov, by your account," said Admiral Vorkosigan, "dragged a platoon of eighteen-year-olds into what came within a hair of being a mass torture-murder."

Miles nodded in memory. His body still twinged with assorted agony.

"For that sin, there is no hole deep enough to hide him from my wrath. Metzov will be taken care of, all right." Count Vorkosigan was terrifyingly grim.

"What about Miles and the mutineers?" asked Illyan.

"Necessarily, I fear we will have to treat that as a separate matter."

"Or two separate matters," said Illyan suggestively.

"Mm. So, Miles, tell me about the men on the other end of the guns."

"Techs, sir, mostly. A lot of greekies."

Illyan winced. "Good God, had the man no political sense at all?"

"None that I ever saw. I thought it would be a problem." Well, later he'd thought of it, lying awake on his cell cot after the med squad left. The other political ramifications had spun through his mind. Over half the slowly freezing techs had been of the Greek-speaking minority. The language separatists would have been rioting in the streets, had it become a massacre, sure to claim the general had ordered the greekies into the clean-up as racial sabotage. More deaths, chaos reverberating down the timeline like the consequences of the Solstice Massacre? "It . . . occurred to me, that if I died with them, at least it would be crystal clear that it hadn't been some plot of your government or the Vor oligarchy. So that if I lived, I won, and if I died, I won too. Or at least served. Strategy, of sorts."

Barrayar's greatest strategist of this century rubbed his temples, as if they ached. "Well . . . of sorts, yes."

"So," Miles swallowed, "what happens now, sirs? Will I be charged with high treason?"

"For the second time in four years?" said Illyan. "Hell, no. I'm not going through that again. I will simply disappear you, until this blows over. Where to, I haven't figured yet. Kyril Island is out."

"Glad to hear it." Miles's eyes narrowed. "What about the others?"

"The trainees?" said Illyan.

"The techs. My . . . fellow mutineers."

Illyan twitched at the term.

"It would be seriously unjust if I were to slither up some Vor-privileged line and leave them standing charges alone," Miles added.

"The public scandal of your trial

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would damage your father's Centrist coalition. Your moral scruples may be admirable, Miles, but I'm not sure I can afford them."

Miles stared steadily at the Prime Minister. "Sir?"

Count Vorkosigan sucked thoughtfully on his lower lip. "Yes, I could have the charges against them quashed, by Imperial fiat. That would involve another price, though." He leaned forward intently, eyes peeling Miles. "You could never serve again. Rumors will travel even without a trial. No commander would have you, after. None could trust you, trust you to be a real officer, not an artifact protected by special privilege. I can't ask anyone to command you with his head cranked over his shoulder all the time."

Miles exhaled, a long breath. "In a weird sense, they were my men. Do it. Kill the charges."

"Will you resign your commission, then?" demanded Illyan. He looked sick.

Miles felt sick, nauseous and cold. "I will." His voice was thin.

Illyan looked up suddenly from a blank brooding stare at his comconsole. "Miles, how did you know about general Metzov's questionable actions during the Komarr Revolt? That case was Security-classified."

"Ah . . . didn't Ivan tell you about the little leak in the ImpSec files, sir?"

"*What?*"

Damn Ivan. "May I sit down, sir?" said Miles faintly. The room was wavering, his head thumping. Without waiting for permission, he sat cross-legged on the carpet, blinking. His father made a worried movement toward him, then restrained himself. "I'd been checking up on Metzov's background because of something Lieutenant Ahn said. By the way, when you go after Metzov, I strongly suggest you fast-penta Ahn first. He knows more than he's told. You'll find him somewhere on the equator, I expect."

"My *files*, Miles."

"Uh, yes, well, it turns out that if you face a secured console to an outgoing console, you can read off Security files from anywhere in the vid net. Of course, you have to have somebody inside HQ who can and will aim the consoles and call up the files for you. And you can't flash-download. But I, uh, thought you should know, sir."

"Perfect security," said Count Vorkosigan in a choked voice. Chortling, Miles realized in startlement.

Illyan looked like a man sucking on a lemon. "How did you," Illyan began, stopped to glare at the Count, started again, "how did you figure this out?"

"It was obvious."

"Air-tight security, you said," murmured Count Vorkosigan, supressing a wheezing laugh. "The most expensive yet devised. Proof against the cleverest viruses, the most sophisticated eavesdropping equipment, you said. And two ensigns waft right through it?"

Goaded, Illyan snapped, "I didn't promise it was idiot-proof!"

Count Vorkosigan wiped his eyes and sighed. "Ah, the human factor. We will correct the defect, Miles. Thank you."

"You're a bloody loose cannon, boy, firing in all directions," Illyan growled to Miles, craning his neck to see over his desk to where Miles sat in a slumping heap. "This, on top of your earlier

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escapade, on top of it all—house arrest isn't enough. You ought to be locked in a cell with your hands tied behind your back. Just so I can get a decent night's sleep."

Miles, who thought he might kill for a decent hour's sleep right now, could only shrug. Maybe Illyan could be persuaded to let him go to that nice quiet cell soon.

Count Vorkosigan had fallen silent, a strange thoughtful glow starting in his eye. Illyan noticed the expression, too, and paused.

"Simon," said Count Vorkosigan, "there's no doubt Imperial Security will have to go on watching Miles. For his sake, as well as mine."

"And the Emperor's," put in Illyan dourly. "And Barrayar's. And the innocent bystanders'."

"But what better, more direct and efficient way for you to watch him than if he is assigned *to* Imperial Security?"

"What?" said Illyan and Miles together, in the same sharp horrified tone. "You're not serious," Illyan went on, as Miles added, "Security was never on my top-ten list of assignment choices."

"Not choice. Aptitude. Major Cecil discussed it with me at one time, as I recall. But as Miles says, he didn't put it on his list."

He hadn't put Arctic Weatherman on his list either, Miles recalled.

"You had it right the first time," said Illyan. "No commander in the Service will want him now. Not excepting myself."

"None that I could, in honor, lean on to take him. Excepting yourself. I have always," Count Vorkosigan flashed a peculiar grin, "leaned on you, Simon."

Illyan looked faintly stunned, as a top tactician beginning to see himself outmaneuvered.

"Besides," Count Vorkosigan went on in that same mild persuasive voice, "it would allow us to send him offplanet till this blows over."

Illyan brightened slightly. "How far off-planet?"

A strange shadow of—pain?—passed over Count Vorkosigan's face and vanished, as swiftly as a cloud across the sun. "As far as he's needed," he replied steadily. "It works on several levels. We can put it about that it's an unofficial exile, departure in disgrace. It will buy off my political enemies, who would otherwise try to stir profit from this mess. It will tone down the appearance of our condoning a mutiny, which no military service can afford."

"True exile," said Miles. "Even if unofficial."

"Oh yes," Count Vorkosigan agreed softly. "But, ah—not true disgrace."

Not? But . . . *off-planet?* Ship duty? Some kind of ship duty, it had to be, he couldn't *get* off-planet except aboard a ship. Miles's heart rose in his aching chest for the first time since he'd left Kyril Island.

"Can he be trusted on detached duties, without supervision?" said Illyan doubtfully.

"Apparently." The Count's smile was like the gleam off a knife blade. "Security can use his talents. Security more than any other department needs his talents."

"To see the obvious?"

"And the less obvious. Many officers

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may be trusted with the Emperor's life. Rather fewer with his honor."

Illyan, reluctantly, made a vague acquiescent gesture. Count Vorkosigan, perhaps prudently, did not troll for greater enthusiasm from his Security chief at this time, but turned to Miles and said, "You look like you need an infirmary."

"I need a bed."

"How about a bed in an infirmary?"

Miles coughed, and blinked blearily. "Yeah, that'd do."

"Come on, we'll find one."

He stood, and staggered out on his father's arm, his feet squishing in their plastic bags.

"Other than that, how was Kyril Island, Ensign Vorkosigan?" inquired the Count. "You didn't vid home much, your mother noticed."

"I was busy. Lessee. The climate was ferocious, the terrain was lethal, a third of the population including my immediate superior was dead drunk most of the time. The average IQ equalled the mean temperature in degrees cee, there wasn't a woman for five hundred kilometers in any direction, and the base commander was a homicidal psychotic. Other than that, it was lovely."

"Doesn't sound like it's changed in the smallest detail in twenty-five years."

"You've been there?" Miles squinted. "And yet you let *me* get sent there?"

"I commanded Lazkowski Base for five months, once, while waiting for my captaincy of the cruiser *General Vorkraft*. During the period my career was, so to speak, in political eclipse."

So to speak. "How'd you like it?"

"I can't remember much. I was drunk most of the time. Everybody finds their own way of dealing with Camp Permafrost. I might say, you did rather better than I."

"I find your subsequent survival . . . encouraging, sir."

"I thought you might. That's why I mentioned it. It's not otherwise an experience I'd hold up as an example."

Miles looked up at his father. "Did . . . I do the right thing, sir? Last night?"

"Yes," said the Count simply. "A right thing. Perhaps not the best of all possible right things. Three days from now you may think of a cleverer tactic, but you were the man on the ground at the time. I try not to second-guess my field commanders."

Miles nodded, satisfied. ■

●In the fight for survival, a tie or split decision simply will not do.

Merle L. Meacham

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Stephen L. Gillett, Ph.D.

WORLDLETS IN COLLISION

Bodies kilometers across, slamming into planets like cosmic bullets, digging holes in the ground hundreds of kilometers across, spraying blankets of debris tens of kilometers: The scenario was strongly resisted for a long time as a serious account of events in the Solar System. It smacked of catastrophism, of the horrible cataclysms wreaked by divine vengeance that had been popular in medieval thinking and lingered well into the modern age. Geology had prospered by the concept of "uniformitarianism," the idea that all you needed to explain landforms was gradual, present-day processes, like erosion, and *lots* of time.

Nontheless, when the dust finally settled, meteorite impact has proven to be the most important geologic process in the Solar System, at least on the bodies with solid surfaces. It was especially important in the early Solar System, and especially on the smaller worlds. (Only volcanism—at some times, in some places—is a runner-up in importance.)

(Today geologists consider uniformitarianism to be merely a restatement of Ockham's Razor, the principle that the simplest hypothesis is preferred. It no longer means that only present-day processes existed in the past, or that all geologic processes have always proceeded at the same rate, or that rare, violent events don't happen occasionally.)

The strictly uniformitarian geologists had a point, though—meteorite impact, especially *giant* impact, was *not* a well documented process on the modern Earth. Between plate tectonics and wind/water erosion, Earth resurfaces itself very efficiently, covering impact scars rapidly on a geologic time scale. It just goes to show how you have to worry about your frame of reference; *a priori*, there was no reason to expect Earth's geologic processes to be so different from most other planets', but they are.

In any event, the classic controversy about the origin of the lunar craters has been laid to rest: Although a handful are probably volcanic, virtually all—ranging in size from microns to hundreds of miles across—are scars from bodies impacting at speeds from 10 to perhaps 40 km/sec. The picturesque, quaint, and now archaic distinctions of craterform structures as "walled plains," prove

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merely to reflect different modifications of large impact craters by such processes as further impacts or partial volcanic infill.

THE IMPACT OF IMPACT

What happens when you slam a rock going 30 klicks a second into another rock?

Splash!

The impacting projectile smears itself out into the target. The energy density is so high—at 30 km/sec, it's about 450,000 joules per gram—that anything is not just melted but largely vaporized. A kilogram of rock, a cobble only 10 cm (4 inches) across, has about 450 million joules, or about that of 200 pounds of TNT. A megaton of energy corresponds to a rock only about 20 meters across. And a collision with an asteroid 10 km in diameter releases about 50 *million* megatons, something like 1,000 to 10,000 times the energy of a full-scale nuclear exchange.

Under those conditions nothing has any shear strength; it acts like a fluid. The impacting projectile splashes out some of the target, too, and generates a good-sized shock wave, which in turn excavates a good-sized hole. Unless the impact is *extremely* glancing, less than 10 degrees or so, the resulting depression is also virtually a perfect circle. This is due to the large size of the shock wave. It starts out, propagating—and excavating—in all directions virtually uniformly. (Actually, what does the excavating is the rarefaction behind the shock wave, as the rock pops back after the shock passes through.)

The size of the excavated hole varies, depending on the target planet's gravity and the impact speed (i.e., energy), but as a rule of thumb the ratio of the projectile diameter to the crater diameter is roughly 1/10. Impact is very good at digging holes!

What is the anatomy of an impact crater? Well, most obviously, you have a circular hole in the ground, with a raised rim and excavated dirt thrown out beyond that (the "ejecta blanket"). Usually the continuous ejecta blanket extends for about a crater diameter beyond the rim. On airless worlds, you also get streaks of powdered rock thrown out long distances (the famous "rays"). Also, here and there chunks of rock get thrown out much farther than average. If big enough, they make holes in the ground of their own: "secondary craters." (If you have an atmosphere in the way, rays don't occur, and secondaries are much rarer; far from the crater, aerodynamic drag just slows things down too much.)

Not surprisingly, you also end up with lots of busted-up rock in the middle of that circular depression. And of course, with all that energy, there's lots of melting, especially as the projectile gets bigger. Some of the melt gets thrown out in the initial splash, where it condenses to beads and droplets of glass. Other melt remains in the crater, where it puddles here and there in low places, for all intents and purposes lava formed by the impact.

Another consequence of all that energy is that there are no intact pieces of meteorite left in the crater! The projec-

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tile itself gets totally melted or vaporized, and what doesn't end up splashed across the landscape as part of the ejecta gets squirted into the broken rock in the middle of the crater. The pieces of intact meteorite you find around some craters, such as at Meteor Crater, Arizona, broke off the main mass before the impact. They then were braked aerodynamically before hitting the ground. (Obviously, you can't expect this to happen on an airless body!)

All in all, a meteorite crater is a lot like an explosion crater: You have an enormous amount of energy released all at once, and it spreads material across the landscape. And indeed, explosion craters (especially those formed by nuclear explosions, back when such things were allowed) have been useful models. Nonetheless, a meteorite crater is *not* an "explosion" crater, as is sometimes asserted. The meteorite doesn't "explode": it's the *energy* of the collision itself that does all the damage, mostly by making the shock wave. The meteorite just has to take the consequences, too.

With bigger craters, other things start to happen. For moderately sized craters, for examples, you get a raised peak in the middle. While the target rock was still fluid during the impact, it sloshed out, *then* back, piling up in the middle; then it froze, caught in the act. This "slosh-out, slosh-back-and-peak" effect is seen nicely in stop-action photos of ink drops plopping into milk, a very small but correctly scaled model.

The very biggest craters (> 300 km or so; the "basins," of which more anon), are even more complicated. They have not just one rim, but multiple, concentric rims, so that the resulting "crater" looks like a target with a bull's-eye. Mare Orientale, the youngest basin on the Moon, shows this very nicely in Lunar Orbiter photos (photo 1).

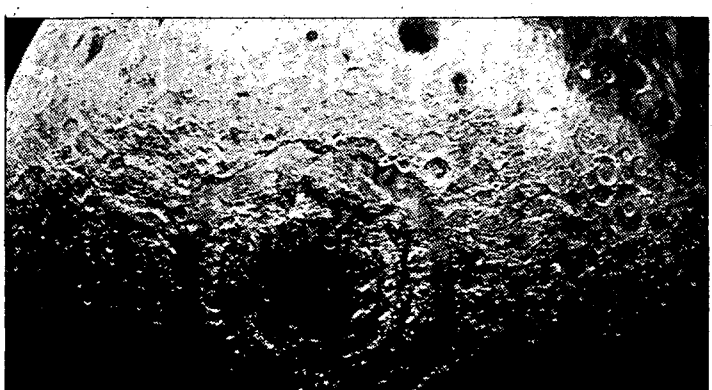

Photo 1. Mare Orientale, the youngest basin on the Moon. Note the concentric rings typical of a large impact structure. (NASA)

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CRATERS AND GEOLOGIC TIME

In the early 1960s, when all this was starting to be worked out with lab experiments and field observations on Earth craters, Gene Shoemaker and his coworkers at the US Geological Survey (USGS) used lunar cratering to provide the basis of a lunar geologic timescale.

A crater and its ejecta blanket are obviously younger than the surface they lie on. So, you can use the relations of craters with the ground they cover to set up a relative chronology of geologic events. For example, a lava flow that fills some craters, but is in turn pocked by others, is younger than the craters it fills but older than the craters on it.

This is nothing more than the "principle of superposition," articulated by such pioneers of terrestrial geology as Hutton and Lyell. On Earth, for example, a canyon must be younger than the rocks it cuts, but deposits within the canyon must be younger than the canyon itself. Working out the arrangement of layers of rock is called "stratigraphy," and it's fundamental to all geologic work. Now, it gives you just a relative timescale; without other information, you can't say whether one crater on top of another is a couple of weeks or a couple of million years younger. But you know it's younger.

Despite their simplicity and power, such well-known terrestrial geologic principles had not been applied systematically to another celestial body before the USGS group's efforts. In the tradition of terrestrial geology, they came up with nice poetic names for the lunar geologic eras they defined (Copernican, Eratosthenian, Imbrian, from youngest to oldest). And their work has held up very well since the Apollo missions, although it's been refined.

You can get even more sophisticated about crater stratigraphy. Craters come in all sizes, and although the really big craters are the most spectacular, far and away they are the rarest. There are vastly more little objects than big ones; the smaller the meteorite, the more of them there are. In fact, every surface rock on the Moon is covered with micron-sized craters (dubbed "zap pits" —scientific terms aren't *always* pompous!) from the ongoing micrometeorite rain.

Now, if you start shooting projectiles of a certain size at a surface, you sooner or later get to a point where every new crater clobbers an old one. Now you have a "saturated" surface; it *can't* record any more craters 'cause it's full already. For each size of projectile, you have a certain density of craters at which a surface becomes saturated.

Thus, you can count the craters in a given size range in a given area (as long as it's a big enough area to give you good statistics) and find out whether the surface is saturated. Obviously, since there are more small objects than big ones, a surface becomes saturated at larger and larger sizes over time.

Again, this a relative timescale: this is older than *this* is older than *THIS*. How *much* older you don't know. To get absolute ages (i.e., ages in years),

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you need radioactive dating of crater materials. You need to count the number of daughter atoms formed in a mineral by the decay of a long-lived, natural radioactive element, which will have accumulated since the mineral recrystallized at the time of impact. (If you *assume* a constant flux of crater-forming objects, you can estimate absolute time; but you have to worry about that assumption a *lot*. As we'll see, the flux of crater-forming objects has dropped off greatly since the early Solar System, and it may not have been constant even then.)

Crater stratigraphy worked so well on the Moon that it was applied to other Solar System bodies, also with great success. As *Analog* readers know, when we got close-up views of other Solar System bodies, we found that the Moon's pocked face is hardly unique. Mars, Mercury, most of the outer planet satellites are all cratered. It just underscored that the Earth is unusual in having very few preserved impact craters. (In having such active surface processes, Earth is accompanied by the Jovian satellites Io and Europa, on which impact craters are also rare or nonexistent. In those cases, though, the resurfacing is all volcanic, being driven by internal heating of the moons as they are flexed by tides in their orbits.)

Impact by small to moderate objects has also formed a "soil," properly termed the *regolith*, on the lunar surface by the haphazard breaking and powdering of surface rock. The regolith consists of intricately overlapping sheets of impact ejecta, a structure unlike any earthly soil. Not only does the regolith contain broken fragments, it also contains common glass fragments, pieces of congealed melt splashed out by the impacts.

Unexpectedly, rocks consisting of fragments cemented by impact glass "impact breccias"—proved to be the most common large pieces in the Apollo samples. (A breccia—"BRETCH-uh," Italian for "broken"—is geologese for any rock made up of broken, angular fragments of other rock. Impacts are good at making breccias, but so are other geologic processes such as faulting, landsliding, and volcanism. You have to tell different breccias apart from their context, and by looking at them in detail. You can't just assume a breccia means an impact!)

Last, you sometimes see in SF stories statements to the effect that "if there weren't a vacuum on the Moon it would be deep in fine dust from all those meteorite impacts." Presumably the author thinks vacuum welding holds that dust together.

This ain't so. Impact is *not* good at making dust to begin with, and of course impact glass tends to glue the fine particles together to boot. In general, mechanical breaking is no good at making very fine particles. That includes erosion on Earth, too. The finest particles on Earth come mostly from chemical precipitation; they are clay minerals or oxides formed from weathering by water. Thus, places with chemical processes going on, like Earth or Mars, are likely to be much dustier than the inert, vacuum-shrouded Moon. (A point to re-

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member when designing your Mars rover.)

THE LATE HEAVY BOMBARDMENT

Anyone who's looked even casually at a picture of the Moon has been struck by the heavily scarred lunar highlands, the light-colored areas of the Moon, where huge craters are chaotically piled upon craters piled upon craters. From crater superposition, you can tell that this intense cratering is relatively old, but actual dating had to wait for the Apollo samples.

It turns out this period of intense cratering had tapered off by about 3.8 billion years ago. This "late heavy bombardment" (affectionately LHB), as it's now called, probably reflects the tail end of planetary accretion, as the planets gradually swept up leftover objects after their formation around 4.5 billion years ago. And this bombardment had an utterly profound effect on the Solar System, as I'll now sketch.

Origin of the Bombardment

Where'd these objects come from, that they could trickle in over seven hundred million years?

Some, especially those that came in early on, may have been just nearby leftovers. Computer models of planetary accretion suggest that hundreds of bodies several hundred kilometers in size still stuck around and were gradually swept up by the nearly formed planets.

But later on, other bodies probably came from farther out, from the general vicinity of the asteroid belt. There, their orbits were slowly perturbed into ellipses that eventually crossed the orbits of the inner planets—and at that point, sooner or later they will hit an inner planet. Moreover, they will hit *hard:* because of the big differences in the orbits, they have a high relative speed.

Jupiter did the perturbing. It appears that Jupiter (and maybe the other outer planets too) accreted before the inner planets did, at about the same time as the Sun itself. In fact, you can think of the system Sun-Jupiter as an aborted binary star, where the second star —Jupiter—didn't get large enough for the nuclear fires to ignite.

Anyway, with Jupiter tugging away at them, most of the planetesimals over the broad range where the asteroid belt is now had their orbits slowly, progressively stretched into ellipses, ellipses that finally reached into the Inner System.

Why did these leftover planetesimals never accrete to form a planet on their own, out there in the asteroid belt? Jupiter was the villain here, too. To accrete initially, planetesimals have to "kiss": to touch very gently indeed. Otherwise, instead of sticking together they will bounce or shatter. And to "kiss," the planetesimal orbits must be virtually perfect circles, so that they can come in together tangentially.

But for even moderately hard impacts, you don't get accretion but erosion. Not only do the planetesimals not stick, they shatter. Anything that happens to accumulate just gets knocked apart again.

(For the same reason, small, rocky planets are probably unlikely in binary

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star systems. The second star acts as a mega-Jupiter, disrupting the planetesimal orbits. Binary stars may be great places for space colonies—there'll be lots of asteroidal resources—but they're probably no good for planets.)

Of course, the erosive threshold gets bigger as the protoplanet grows. An impact that would shatter a body 1 km across might stick to a body 100 km across. As we'll see, this may be relevant to the origin of the atmosphere and oceans. Still, though, gravity increases only slowly as the protoplanet grows, so it isn't effective at holding the ejecta down for a long time.

The present-day asteroids are probably the last, lingering bits of the original population of planetesimals. They are the tiny fraction that found their way into stable orbits. Of course, all the present-day asteroids together mass far less than a planet. Most of the material is gone, thrown outward or inward long ago by the gravitational perturbations.

As an aside, there's also geochemical evidence that the asteroids were never a single planet. Most meteorites are pieces of broken-up asteroid, according to the conventional wisdom. (For which there is actually some evidence. But at least one meteorite came from the Moon, and some may have come from Mars as well. But that's another story.) Anyway, the asteroid-derived meteorites all had their radioactive clocks set at around the age of the Solar System—4.5 billion years. The "clocks" get set when the minerals cool enough so that the daughter atoms from radioactive decay can't diffuse away. So, the meteorites have been cool all this time. They'd have been a lot hotter if they'd ever been inside a planet of any size since planetesimal formation. (In some cases, you can even tell when pieces of a meteorite were broken off, presumably by collisions. Cosmic rays striking an outside surface make short-lived radio-isotopes in a thin "rind" under the surface, and by measuring the amount and type of isotopes formed you can get an "exposure age" for that surface.)

The Basins

The late heavy bombardment included some very large objects indeed, worldlets at least up to several hundred kilometers across. On the Moon, they excavated gigantic circular depressions—megacraters, now termed "basins" by planetary geologists. Many of these basins are now filled by the basalt lava flows making up the dark plains, or "maria" (MAH-ree-uh): Mare Serenetatis, Mare Imbrium, Mare Orientale, and others (photo 2).

(Why'd the lava fill the basins? Why does *any* liquid fill the low places? A liquid flows downhill. That's all. Another misconception you see occasionally is that the mare basalts were "formed" by the giant impacts themselves, giant impact melts, as it were. Wrong: They're real live lavas, erupted later, and at various times. Pre-Apollo, the USGS work had shown that the mare plains are younger, simply because they're a lot less cratered.)

The Mascons

Back when the Lunar Orbiters flew

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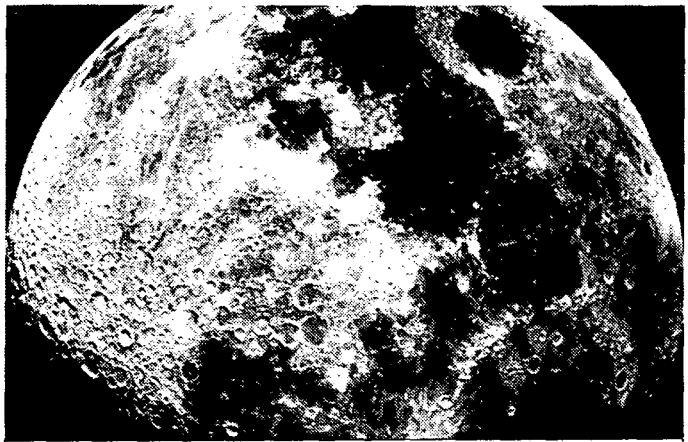

Photo 2. The dark maria on the visible face of the Moon are roughly circular. They are stacks of lava flows filling basins left by giant impacts during the heavy bombardment. (NASA)

in the 1960s, their orbits changed slightly but unexpectedly as they crossed over the maria. The changes were those you'd get if there were additional mass present in the maria, so evidently the maria were locations of "mass concentrations." In typical techie talk, "mass concentration" soon got telescoped to "mascon."

Initially, some people thought the mass concentration came from the basin-forming projectile itself. Maybe a large body of nickel-iron, or something, was still sitting at the bottom of its basin. This was a naive notion, as you can now guess, because of course the original impacting body had splashed all over the Moon. (This early idea is still—ahem!—found in some SF stories, however.) You also don't see mascons in basins *not* containing maria.

What *are* the mascons, then? They're clearly real gravitational features, and they must be related to the maria. They most probably result from the lava flows themselves, which, once they've cooled, are denser than the rocks around them. The people who model the gravity field of the Moon have found the mascons are best fitted by a thinnish disk, which presumably corresponds to the stack of lava flows filling the basin. (Some of the extra mass may also come from the lunar mantle having flowed up a bit at depth, in response to the thinning of the crust after the basin was formed.)

The LHB and Earth

Since the oldest Earth rocks are "only" about 3.6 billion years old—and are highly metamorphosed at that—we lack a terrestrial record of the LHB.

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Nonetheless, the objects *had* to hit the Earth too, and they had to have major effects.

One thing they may have done is jump-started plate tectonics. Plate tectonics, of course, is the style of tectonics on Earth, in which new lithosphere is created at spreading centers such as the mid-Atlantic Ridge, and dives back into the mantle at subduction zones, marked by oceanic trenches. In between, the lithosphere is broken up into a couple dozen or so rigid "plates" that bump, jostle, and grind at their edges. ("Tectonics" is geology-speak for all the processes that raise the land's surface.)

Plate tectonics is probably driven by extremely slow convection in the mantle below the lithosphere, in a relatively weak zone termed the "asthenosphere." The convection is driven by the internal heat of the earth, from the decay of long-lived radioactive elements. Nonetheless, it looks like starting that convection is hard. Slamming a few basin-formers into the early Earth may be a way to kick things over initially.

The LHB and the Inner System

Both Mercury and Mars show ancient, extremely densely cratered surfaces locally (Mercury over most of the photographed hemisphere; Mars mostly in the southern hemisphere). It's most reasonable to suppose that this cratering also reflects the late heavy bombardment. From the age-dating on the lunar samples, then, it appears that these densely cratered surfaces can be no younger than about 3.8 billion years. Thus, the late heavy bombardment has also provided us with a crude way to correlate geologic time between planets. This is especially useful since we don't yet have any well-characterized samples from any other world besides Earth and the Moon. (Some meteorites *may* be pieces of Mars, but that's by no means proven as yet.)

Of course, one day we'll have actual rock samples from Mercury and Mars that we can date in the lab, but alas, that still seems a ways off. . . .

Obliquity, Rotation Rates, and the LHB

All the planets spin about an axis. But those spin axes are tilted higgledy-piggledy; Uranus is even spinning on its side. This scatter of obliquities is a classic problem in Solar System formation; why are they so irregular? ("Obliquity"—wonderful word!—is the tilt of a planet's axis.)

The rotation rates, of the inner planets expecially, are also a problem although a less spectacular problem. If you accrete a planet from planetesimals you should end up with zero net rotation. The small impact of the accreting planetesimals should tend to cancel, because on the average they hit on one side as often as on the other side.

The answers? The LHB, again. The rotation rates and axial tilts of the planets are largely a cosmic crapshoot, from the vagaries of collision of the last few large bodies.

And, of course, both axial tilt and rotation rate have major effects on planetary climate. To be sure, rotation rates can later be slowed or even stopped by tidal interactions, as has happened to the

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Earth, and gravitational perturbations can cause axial tilts to vary, as happens to Mars systematically. However, in some cases the tidal effects may have been exaggerated. For example, it's been a real problem to understand how tidal braking alone could have slowed Venus's rotation down to practically zip, if it originally rotated about as fast as Earth or Mars. But, by happenstance, Venus may *never* have spun very fast.

Birth of the Moon

Even our large Moon may have been formed by a truly gigantic collision. All three classic models for the Moon's formation (fission or "child"—the Moon was torn out of the Earth; co-accretion or "sibling"—the Moon and Earth formed together as separate bodies; capture or "spouse"—the Moon was formed independently of Earth and later captured) have severe dynamic and/or geochemical difficulties.

The basic dynamic difficulty for the "child" hypothesis is that the total angular momentum, or "spin," of the Earth-Moon system just isn't big enough. If you put the Earth and Moon back together, the Earth is not spinning fast enough for the Moon to fly off. Of course, now that we know about the LHB, this is less of a problem, 'cause subsequent huge impacts on the Earth could have rearranged the angular momentum. Still, computer simulations show it's hard to get the Earth spinning so fast in the first place.

For the capture hypothesis, the dynamical problem is that it's real hard to hold onto something gravitationally. Even if the early Moon strays close enough, it's got enough energy to just whip around the Earth and retreat again. To capture it, you need some way to arrange *friction;* to dissipate energy so that once the Moon's in Earth's vicinity it hasn't got enough energy to go away again. (Massive tides in a near-molten Earth, as the Moon whips by closely, may be one way to set up enough friction.)

As for the chemical constraints, it's been known since Newton that the gross composition of the Earth and Moon is different, because of their very different bulk densities (5.5 grams per cubic centimeter [g/cc] for the Earth versus 3.3 g/cc). Traditionally, this difference had been attributed to the absence or near-absence of a lunar iron core, and that looks to be true from the Apollo seismic results. Nonetheless, the Apollo samples also show great geochemical affinities with Earth rocks, suggesting that the Moon is, after all, closely related to the Earth.

The new, trendy, and fourth model is the "mega-impact" model: a more-or-less Mars-sized body collides with the Earth. Lots of the ejecta leaves the Earth's vicinity completely, but enough remains in orbit to form a ring of rocky debris, which in turn coalesces to form the Moon. Thus, both the lack of a lunar core *and* the general similarity of lunar and terrestrial rock are explained naturally. And, computer models also suggest that a couple of Mars-sized protoplanets careening through the inner System are likely toward the end of accretion. They'd be like runaway 18-

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wheelers on a downgrade: Sooner or later, they're going to hit something.

Nonetheless, such a "worlds in collision" hypothesis would be pretty *ad hoc* except that the computer modeling suggests that: (1) if you *did* have a glancing collision by a Mars-sized body, a debris ring that subsequently coalesced could in fact form; and (2) a leftover Mars-sized body or two is not unreasonable. (This also demonstrates the growing use of supercomputers in planetary science.)

Air from the Sky

The very air we breathe, the water we drink, may be a gift of the LHB. As I noted, at least some of the bodies in the LHB probably came from farther out in the solar nebula. Thus, their composition was probably different from the planetesimals in the inner solar system; it would have been a lot cooler out there, and volatile-rich material—ices, not just rock and metal—could condense out. (The "volatiles" are the low-melting-point, low-boiling point stuff making up atmospheres and oceans.) And when these bodies got slung into the Inner System, they brought their volatiles with them—the raw material for atmospheres and (on the Earth) an ocean.

"Outgassing" by volcanic activity, the classical atmosphere-origin hypothesis still generally cited in textbooks, may have been less important. In the outgassing hypothesis, the volatiles came out of volcanos after the Earth had stewed a bit. But, although we can see volcanic outgassing happening on Earth today, the gases may just be volatiles recycled by plate tectonics. (The impact origin of volatiles, although currently trendy, actually was anticipated by the late Harold Urey, back in 1952, in *The Planets*.)

The nice thing about having the volatiles come in on the LHB is that it naturally accounts for the total lack of water in lunar rocks. The Moon's gravity is simply too low to hold onto the stuff that splashes out from such a high-speed impact, but the much larger Earth *can* hang onto it. If atmospheres resulted from volcanic outgassing, we should see *some* trace of water left in lunar rocks; we don't though, despite lots of looking. Very large impacts might even splash volatiles right off a small planet, possibly another way to set up the (slight) differences in volatile composition we see among Venus, Earth, and Mars.

THE RECENT RECORD

Obviously, cratering didn't stop with the abatement of the LHB. A much smaller, but still significant, flux of cratering objects has prevailed in the 3.8 billion years or so since. (Obviously, this is "recent" only in a geologic sense!)

What are these guys? Some may be the last gasp of material perturbed out of the asteroid belt, still trickling in, stone by stone. Others, however, are probably comets; material perturbed *way* out, which finds its way into the Inner System. Most comets, of course, miss on their whirlwind trip through. Occasionally, though, one will pass close enough to a planet (generally Jupiter) to get trapped in a short-period

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orbit. Then it has a much larger chance of hitting something, and eventually it will. Even if all the ice has been boiled out of it by then, so that it no longer looks like a comet, but an asteroid.

(A note on terminology: a "comet" is an object that shows a "coma" (Latin for "head of hair"); seen through the telescope it looks fuzzy from the volatile stuff boiling out. An "asteroid," as the name implies, looks "starlike"; it's just a point of light. The name "asteroid" does not depend on the kind of orbit. Even if an object started out as a comet, if it looks like an asteroid through a telescope, that's what it is. By definition.)

Whatever their name or origin, these objects in their planet-crossing orbits are responsible for the present cratering rates on the inner planets. Since the mid-seventies, a number of scientists, pioneered by Gene Shoemaker of the USGS (yes, the same Gene Shoemaker who worked with lunar craters) have been carrying out systematic telescopic search programs for these "planet-crossing asteroids" (PCAs for short) to estimate how many there are and how their orbits are distributed. From these you can then (hopefully) estimate the present impact rate.

PCAs can be classed into several categories. Apollo objects, named after their prototype, the asteroid Apollo, have closest approaches (perihelia) within 1 astronomical unit (AU—the average distance from the Earth to the Sun), so that they come closer to the Sun than the Earth does. Amor objects have perihelia outside 1 AU but less than 1.3 AU. Aten objects, a new class discovered since the systematic searches began, have orbits smaller than the Earth's; i.e., the semimajor axis of the orbit is less than 1 AU. And finally, a "Mars crosser" is a catchall term for anything that crosses the orbit of Mars but doesn't get in any farther. The categories are subject to change, for example; perturbations change Amors into Apollos and back again. And eventually, of course, they all get swept up by collision.

(Another bit of terminological lore: Asteroids in the Main Belt are given feminine names, whereas asteroids in oddball orbits, like the planet crossers, are given male names. This tradition started with the discovery of Eros in the late 1890s. Eros (appropriately enough) is an Amor object.)

Knowing how many PCAs there are in the various categories, and how big a target the Earth is, you can calculate how often the Earth is hit, on the average. *If* you then assume a constant, steady-state population, in which new objects get fed in at about the same rate as old ones crash, *and* if you assume the present population is typical, then you can get absolute time. The older the surface, the more craters; and since you know how many craters form in a certain time, on the average, you can just count 'em up. (Both assumptions are big *if's*, as we'll see.)

So, sooner or later a PCA is gonna collide with the Earth. What (aside from digging a big hole in the ground) happens then?

Probably lots of things, at least if the object is big enough. On a planet with

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an atmosphere like the Earth, a big impact will loft lots of debris, and that will cause severe climatic effects. (Exactly *what* effects we're not really sure, but everyone agrees they'll be substantial.)

Intense volcanic activity at and around the crater is another possibility. Digging that big hole in the ground will take a lot of pressure off rocks deeper in the crust. On a big planet like the Earth, rock deep down is hot enough to melt under surface conditions; but it's under enough pressure that it stays solid. Take the lid off, though, and, well . . . you'll get a *lot* of molten rock.

And, on a living planet like the Earth, one possible consequence of all this violence is a major extinction. As all *Analog* readers know, there's been a lot of controversy recently about whether the major extinction at the Cretaceous-Tertiary, or K-T, boundary, about 70 million years ago, was caused by a large meteorite impact. This mass extinction wiped out not just the dinosaurs, but many other critters as well: ammonites, (sea-going cephalopod mollusks with beautiful coiled shells), lots of forams (single-cells protozoans with tiny calcite shells), rudists (a variety of reef-building clam), and a host of others.

Although the impact idea is still controversial, it has met a remarkable degree of acceptance—which may be a bad sign. Even if it's not true, though, the impact hypothesis has gotten lots of different specialists talking to each other: paleontologists of various flavors, celestial dynamicists, geochemists, climatologists, geophysicists. . . . Any hypothesis that succeeds in breaking down the disciplinary barriers is invaluable even if it turns out to be wrong!

Of course, if it happened once, it probably happened more than once, and an impact origin for other major extinction events is being enthusiastically sought. Another candidate that's gotten wide interest is the Frasnian-Frammenian extinction, about 350 million years ago. (I know, those aren't household words . . . they're subdivisions of the Devonian, one of the classic geologic periods. That's right, this major extinction is *within* a major geologic period! This came about from the vagaries of the ways in which the geologic systems were defined in the last century.) Anyway, an impact cause for the F-F extinction is even more controversial than for the K-T.

If the population of PCAs is truly steady-state, on the average major impacts—and their consequences—will happen evenly. Any interval of time is as likely to get smitten as any other. But, has the impact flux truly been steady-state?

Maybe not. In 1984, two well-respected paleontologists, David Raup and John Sepkoski, reported an approximately 26-million year periodicity in major extinctions. Immediately this led to the question, what could drive periodic extinctions? (A better question was whether the periodicity was real, but that came later.) Anyway, granted periodic extinctions, one driver people came up with is the "Nemesis" hypothesis. A dim companion orbiting the Sun in an extremely elliptical orbit periodically perturbs a bunch of comets in the distant "Oort cloud," where comets are thought to normally reside.

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Then, some of these comets end up with orbits that carry them into the inner solar system, where they could collide with Earth, or at least get trapped into short-period orbits and collide later.

However, when people looked more closely, the orbit proposed for "Nemesis" is probably unstable, since at its farthest point (aphelion) it would be so far from the Sun that gravitational perturbations from nearby stars (!) would eventually pull Nemesis completely free from the Sun. So Nemesis doesn't look good at this point.

The periodicity of mass extinctions remains highly controversial. There are two things the human mind likes to fit through data—straight lines, or sinusoids (waves). Even if it isn't real, though, random perturbations of the Oort cloud, perhaps by passing nearby stars or other dark bodies, could happen, and could trigger catastrophic comet showers occasionally.

(Also, of course, major extinctions can have—and probably *do* have—lots of causes. To paraphrase Kipling, there are at least nine-and-sixty ways to obliterate a bunch of species. Climate change, ecologic crisis . . . the list is legion.)

In any event, geoscientists now recognize that rare but catastrophic extraterrestrial events will have affected the Earth intermittently throughout geologic time. Such events should leave traces in the geologic record, and some of us are looking for them!

A dinosaur buster could hit tomorrow, of course, and a number of classic SF novels (*Rendezvous with Rama*, by Clarke; *Shiva Descending*, by Benford & Rotsler; *Lucifer's Hammer*, by Niven & Pournelle) have dealt with the consequences. SF writers have also warned, for years, that we need to watch for these things, and be prepared to *do* something about them, if we don't want these novels to come true.

Now the scientific community is starting to agree. A few years ago, the journal *Geology* ran a controversial paper on the obligation of the geoscience community to help guard the Earth and its human (and inhuman) denizens from natural catastrophes, among which were earthquakes, volcanic eruptions, and — meteorite impact.

Major impacts have struck the Earth in the geologic past, and it *will* happen again sooner or later.

But only if we keep screwing around. Forestalling a catastrophic meteorite impact is yet another reason to stop dithering and get out into space. ■

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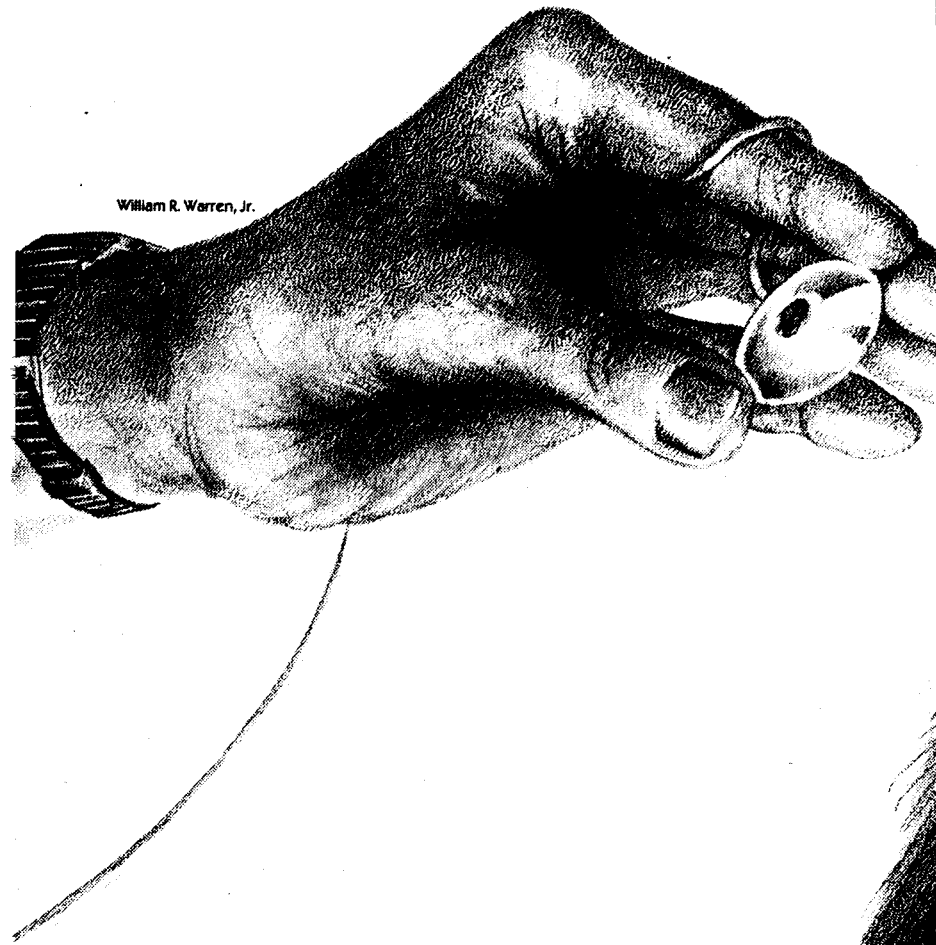

William R. Warren, Jr.

There's a hidden danger in not taking fringe research seriously. Suppose somebody gets real results and decides it's not worth bothering with usual channels. . . .

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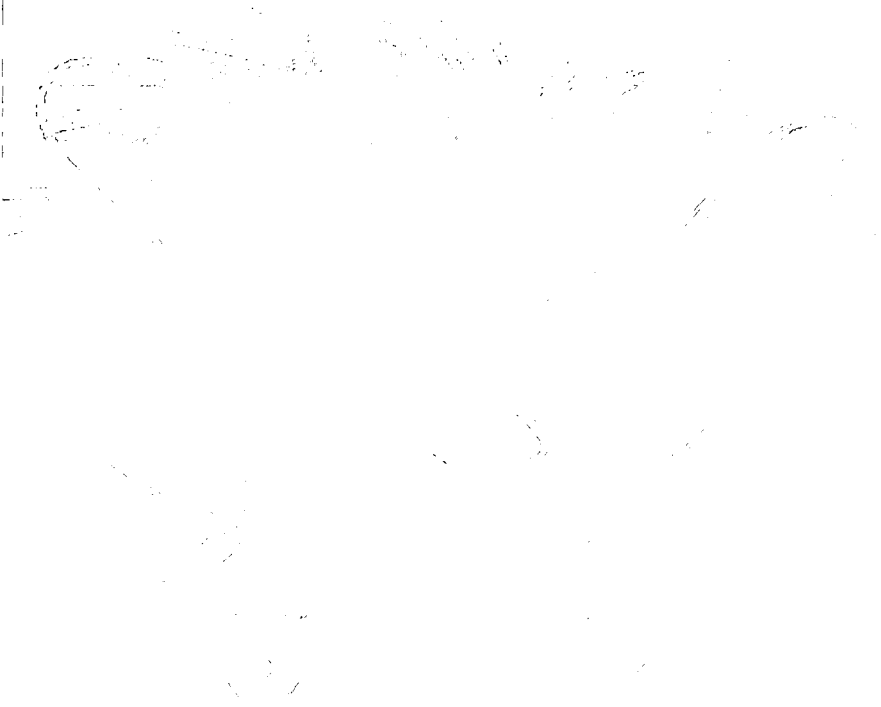
PARAPSYCHOLOGY TODAY

Jerry Ouspenskaya



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Paul Wilson's laboratory was spotless. That condition reflected less about his habits as a researcher than it did about the requirements for maintaining a federal grant, but even if he wasn't tidy by nature, the enforced organization did at least influence his methods. Since he had to keep the lab clean anyway, it was easier if he kept his experiments orderly and tightly controlled from the start, and that in turn made it easier to track down the cause for any unexpected results.

Not that Paul had had many unexpected results in his five years as an investigator into the nature of parapsychological phenomena. Psychic research was frustratingly consistent in its negative data. Still, absence of evidence is not the same as evidence of absence, and that truism—plus annual funding through the Department of Defense—kept Paul searching for the one piece of positive, repeatable evidence that would revolutionize his field.

The day he found it was a typical day. His test subject, Herschel Dewey, sat in the arm chair beside the encephalograph, rolling his eyes in nervous agitation while Paul connected the leads to his scalp.

Though it was mid-summer, Herschel wore a red and black flannel "lumberjack" shirt with the sleeves rolled up, a lighter weight chambray work shirt under that, and a faded black T-shirt with only the letters "—e the ba—" visible beneath that; all tucked into a pair of Levi's that looked as if they could have come from the original gold rush days. On the floor beside him rested two plastic grocery sacks tied at the top. For all Paul knew, everything the guy owned in the world was in those two sacks.

Paul tried to ignore the rich aroma that pervaded the room, while at the same time cursing the impulse that had led him to recruit test subjects from the bus depot. The bus depot held a unique cross-section of life, all right, and its denizens certainly didn't hold out for high wages, but there was a limit to the sacrifices Paul was willing to make for the sake of economy. Next time he was going to recruit from the college sororities and to hell with the expense.

Though it was a warm day, Herschel held his stocking cap in his hand, ready to pull it back on at a moment's notice. Its aluminum foil liner, which he wore "to keep the rays out," was a crumpled ball inside the hat.

"I'm hearin' 'em," he reported as Paul attached another lead.

"Good, good," Paul said in a tone he hoped conveyed reassurance rather than the cynical pity he really felt. He had no doubt that Herschel heard voices in his mind, all right, but that there were really any objective voices to be heard he doubted mightily. Where was the evidence, if it were so? Telepathy would be a useful ability; why wasn't it spread all through the gene pool if it really existed? Certainly Herschel Dewey couldn't represent the next step in evolution.

"I wasn't always like this, you know," Herschel said.

"Of course not, of course not," Paul muttered, sticking another lead to Herschel's none-too-clean scalp. Well, it would be clean afterward, he thought, since part of the encephalography process was a shower afterward to clean the

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conductant residue from the subject's hair.

"It'll be good to wash my hair again," Herschel went on. "I used to wash it every morning, back when I had my apartment."

"I'm sure you did. Turn your head this way, please. Carefully. There, that's got it. Now, let's see if the machine can tell us anything about these voices of yours."

Paul turned on the encephalograph. The pens jumped, then settled down to do their usual dance in tracing out Herschel's brain activity on paper. Paul had seen enough traces to know a normal one from an abnormal one, and Herschel's was no surprise. There, clear as a bold headline to someone trained to read it, was the telltale trace of something wrong.

Something wrong, but what? Well, for starters his alpha waves were still going strong, despite his wide-open eyes. Usually opening the eyes suppressed the alpha state. His beta trace showed the 14-16 cycle bursts characteristic of sleep, and superimposed on nearly every trace was a slow, 4-6 cycle theta wave that shouldn't have been there either. Herschel's brain was doing some strange things indeed. What was going on in there?

"It's the voices, doc."

"Beg your pardon?"

"The voices. I'm still hearin' 'em. That's what you're seein' there."

"The voices."

"That's right."

How did Herschel know that Paul was seeing something abnormal? For the first time since the amateur magician had nearly fooled him over a year ago, Paul felt a shiver run up his spine. "Is, uh, is one of them *my* voice?" he asked.

"Can't tell. They aren't like voices you hear. I call 'em voices 'cause that's the closest word I can think of to describe 'em, but they're just a bunch of, well, *stuff* going on, really; and then I get ideas. Sometimes it's like I overhear what a conversation's about without hearing the words, you know, but sometimes it's more than that. That's why I wear the tin foil. Keeps me from doing things that ain't my idea."

Doing things that weren't his idea? Like hypnotic suggestions, perhaps?

Scratch your nose, Paul thought. With a felt pen he made a mark on the trace as it emerged from the plotter, then another when Herschel reached up and rubbed the back of his hand across his nose.

"Can I put the foil on again?" Herschel asked.

Shaken, Paul said, "That's a good idea. Yes, go ahead."

Herschel reached into his hat and pulled out the wad of foil. He managed to get it flattened out again without tearing it, then molded it down over his head the way someone would wrap a bowl full of leftovers. He was an old hand at it; the corners came down over his temples, the bridge of his nose, and the nape of his neck on the first try.

"There we go," he said, visibly breathing easier now that he had his protection on again. "They're gone."

And so were the abnormal traces. Paul made another mark on the paper, scribbled "Tin foil" alongside it, then allowed himself to grin. "So," he said. "What brand of foil do you use, anyway?"

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* * *

Bob McRae was having a paranormal experience as well, but then, just about everything he did in connection with his job was paranormal. At the moment he was interviewing Madame Lucretia, noted psychic and longtime friend, in the hope of mining something printable out of an otherwise quiet afternoon.

"How about Elvis?" he asked. "Have the space aliens told you anything new about Elvis lately?"

"Regrettably, no," Lucretia said with a frown. "They've been concentrating their attention on Bigfoot. Evidently there's some kind of happening going on with them right now up in Washington. State." Her frown broke for a moment.

Bob rocked back on his cushion. His feet were numb. Lucretia didn't have any chairs in her parlor, and sitting on cushions cut off the circulation in his legs.

"What sort of a happening?" he asked.

"I have not asked the oracle," she intoned in the voice she used for paying customers.

Bob got the hint. Friends or not, she was a practicing professional, and she didn't work for free. He rolled to the side so he could reach his wallet in his hind pocket, feeling the tingling begin in his feet as they received blood again. Wincing, he pulled five twenties out of his wallet and handed them over to Lucretia. She made them disappear discreetly inside the folds of her snow-white robe.

"Lucretia thanks your publisher," she intoned, smiling now. She swept the silk cloth off the enormous glass ball on the low table between them and added, "Now, let us see what we can find out about Bigfoot."

Paul's eyes were focused on infinity. He was staring at the cork wall in his office, at a spot about three feet above the government-issue shredder the D.O.D. had insisted he install for "sensitive documents," a spot on which he had pinned Herchel's trace pattern—but he was seeing far beyond that. He was seeing the future, or *a* future, at least. A future in which he was remembered alongside Newton and Einstein and Hawking, not as a physicist but as the man who codified the hitherto chaotic mess that had been the study of the mind.

He heard the soft patter of water running in the shower down the hall, and wondered how long Herschel had had his incredible ability. Had he been born with it, or was it the result of a knock on the head or some chance combination of recreational drugs? How long had he suffered the "voices" before he learned that aluminum foil would block them out? How long had he been at the mercy of every strongly-felt suggestion thought at him?

Paul wondered if Herschel's ability was somehow responsible for his current living situation. Did all the stray thoughts coming his way add up to the muddle his life had become? If that was the case, then his condition could explain why telepathy wasn't everywhere in the gene pool. If it always made a person so open to suggestion, so unable to live his own life, then it was no surprise that natural selection kept it from expressing itself more often.

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The opposite power, on the other hand, the ability to make a normal person do what you suggested; now that would definitely be a survival trait. If Paul could develop that . . .

He was obviously going to have to spend quite a bit of time with Herschel, learning how the power worked. If that was the case, then he would have to rent him an apartment and get him used to bathing regularly again.

He heard the shower shut off. *Did you wash behind your ears?* he thought, imagining the question directed at Herschel. A moment later he heard the shower start up again.

"Space Alien Gives Birth to Dinosaur!"

"Two-headed dinosaur."

"In Central Park, of course."

"No, no. On the White House lawn."

"Good. Go with it."

"How about this: Noted Psychic Reveals Wonder Diet of the Dead."

"The afterlife, dummy. The dead makes it sound like it'll kill *you*."

"All right, the afterlife."

"Yeah, and sub-head it: 'Elvis loses two hundred pounds in a week.' "

"No, no, get it all into one headline. Elvis Loses Two Hundred Pounds on Amazing Afterlife Diet."

"There you go. Write it."

Bob scratched the headline into his notebook, put a star beside it, and took another swig of Guinness. He loved these brainstorming sessions. Four writers and an editor in a small room with pizza and beer could generate an entire tabloid full of stories in less time than it took to read them. In the fifteen minutes since they'd started, he'd come up with three good permutations on the currently hot themes; those plus the Lucretia interview would be enough to fill his share of the next issue. True, he still had to write the actual articles, but that was never a problem. A six-pack generally cured any writer's block he might encounter, and it put him in the right frame of mind to reach his average reader as well. He would be done by midnight, easy.

But behind the warm glow of brainstorming and booze, he felt the familiar nagging of his conscience. He had gone through four years of journalism in college for this? What had happened to his childhood dream of becoming a world-renowned investigative reporter? What had happened to his sense of *honesty*, for Christ's sake?

It had starved to death along with his ambition after three years doing the classifieds for the *Daily Times*, that's what. Idealism was fine when it got you somewhere, but there came a time when a person had to bow to practicality.

Still, it would be nice to actually write a *real* news article once in a while.

Into a lull in the conversation, he said, "Psychic Phenomena Proved Impossible!"

There was a moment of shocked silence, then uproarious laughter from all sides.

"No, no," someone shouted. "*Elvis* Proved Impossible."

Her name was Cyndi, and the spelling, she was quick to point out, was her mother's fault. If her looks had also come from her mother, then Paul wouldn't have minded bumping into the woman in an elevator somewhere. He

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wouldn't have minded bumping into Cyndi, either, if it came to that. Repeatedly.

As it was he had his hands buried up to the knuckles in her curly blonde hair, taking his time in placing the electrodes and sneaking glances down the front of her tube-top. She, at least, knew how to dress for summer.

Herschel, still in his lumberjack shirt but without the stocking cap, sat beside her, a set of electrodes already in place on his head. He had the tin foil on loosely over the electrodes.

Both sets of wires fed into separate encephalographs, the output from which went in turn into a computer running a comparator program. The program would trigger a red light in front of Cyndi when the traces were not similar, and a green light when they were. It was a simple enough biofeedback loop; if Cyndi concentrated on getting a green light, she would eventually modify her brain waves to match Herschel's. Paul could switch the comparator from band to band, letting Cyndi match one band at a time until they determined which one—or combination of them—was responsible for Herschel's ability.

"OK," he said as he seated the last electrode into the conductant and checked to see that he had a good signal, "We're ready. Herschel, take off your foil, thank you. Now just relax and try to hear the voices."

"Comin' in loud and clear," Herschel said. He frowned, then added, "Don't you worry none, miss; they aren't going to hurt you any."

Cyndi swallowed, her eyes shifting to Herschel and away again. "Thanks," she said.

"No talking during the test, please," Paul said. "Now Cyndi, you just concentrate on the green light. Nothing else." He started the program running.

The light stayed red for long minutes, flickered green once, then red again for minutes more. "It's not working," Cyndi said, but Paul put his hand reassuringly on her shoulder and said, "Don't worry. It takes time. Just let your mind wander, and keep your eyes on the light."

More minutes passed while the light flickered green, back to red, then green again, this time for a few seconds before returning to red, then green for longer and longer periods. Finally it held solid on green.

Scratch your nose, Paul thought at her. Herschel obediently scratched his nose, but Cyndi's hands remained in her lap. Paul shook his head and switched to the next band. He hadn't really expected anything so soon. In truth, he wasn't sure if he expected anything at all. The ability could be unique to Herschel, and no amount of brain wave modification could reproduce it.

But half an hour later he was beginning to think differently. By then Cyndi had duplicated Herschel's Alpha, Beta, and Theta waves, and was even working on the sleep spindles—and she was responding to Paul's telepathic suggestions. Sluggishly and late, her motions echoing Herschel's after long seconds of apparent confusion, but she was responding.

The question now was whether she was actually hearing the suggestions herself, or if she was somehow getting them through Herschel. Paul tapped a command into the computer keyboard,

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switching the comparison from Herschel to Cyndi's own trace. Now Cyndi was just maintaining her own modified brain wave pattern, independent of Herschel.

Paul motioned to Herschel to put on his foil hat again. With a look of relief, Herschel complied.

Now yawn, Paul thought.

For a moment, nothing happened. Then, just as Paul was about to make the suggestion again, Cyndi stretched and yawned in a display that had both Paul and Herschel doing it moments later.

Was it visual contagion, or were they all psychic now? Paul thought, *Tap your right index finger on the arm of the chair,* and seconds later Cyndi began drumming her right index finger on the arm of the chair. Herschel remained still.

Hot damn, he had it! He had established the existence of telepathy, and with a bombshell blonde at that. *I think we should celebrate,* he thought at her. *Be here this evening at seven.*

Cyndi turned in her chair to look at Paul. Her face bore a puzzled expression, but after a moment a slow smile erased it. With a little nod and a wink, she turned back to look at the green light.

"You shouldn't have done that." Herschel paced the laboratory floor, the worn soles of his tennis shoes squeaking with every turn. "You may not think it's any big deal, but that girl's probably going to fall in love with you now."

Paul was taken aback at Herschel's sudden animation. "What are you talking about? I arranged a date. I didn't tell her to fall in love with me."

"Not out loud, no. Not *consciously.*" Herschel used the word like a brick hurled through a window. "But you don't know what it's like. The voices don't give you any choice. Somebody wants you to do something and you do it, no matter what. It's like a, wha'dya call it, a compulsion. You gotta do it. But you don't even know there's anything funny going on. It's like it was your own idea."

"So?"

"So you told her to come to you tonight, didn't you? Don't bother sayin' you didn't; I felt it. One layer of foil don't block everything, and you were thinking that *loud.* You know what it's gonna take for her to do that? She'll have to convince herself she likes you, that's what."

"So what if she does? I'm not exactly Quasimodo, you know."

"She thinks so."

"What?"

"She didn't like you the moment she saw you. I could tell."

He probably could at that, Paul thought. Hmm. So the little piece didn't like him—well, too bad. She did now. And if it meant changing her priorities around a little, well, it was all in the interest of science. He had to learn how this power worked, didn't he?

But not at the price of his prime subject. He forced himself to look contrite as he said, "All right, then, when she gets here tonight I'll straighten her out."

Herschel looked at him as if he wanted to take off the tin foil and make sure, but he apparently thought better of it. "See that you do," he said, then

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pivoted with a squeak and stalked out of the lab, shirt tails flapping behind him.

The research was coming along nicely. With Cyndi's help—and with the help of half a dozen of her sorority sisters after Paul had planted the suggestion that she convince them to come—Paul was beginning to develop a good idea of how Herschel's power worked. Herschel himself was spending very little of his time in the lab, but that didn't really matter since Paul was now able to induce the receptive state in anyone he chose.

Herschel had been right; there didn't seem to be anything the subject wouldn't do when commanded. Paul didn't try all of the more extreme possibilities, but he certainly tried enough to be convinced that that was the case. Even better, the subjects seemed to integrate their experiences into their everyday lives as if nothing out of the ordinary had happened. At least, if Cyndi still harbored any ill feelings toward him she certainly didn't show it, and none of the other girls seemed concerned that they had all developed an intense interest in him over the last few days, either.

He had learned a few other things about the power as well, most notably that it didn't seem much affected by distance. That wasn't particularly useful at the moment, since the receiver still had to be hooked into an encephalograph to do the multi-band biofeedback, but it wouldn't take much to develop a portable unit.

Paul was even developing a theory of how the power had come to be. Everybody had the ability, he reasoned, but because of the way it left a person helpless to anyone's suggestion, humanity had evidently evolved an immunity to it. Inducing the power in someone was really just the process of suppressing their natural immunity and allowing them to hear the psychic noise that was always bombarding them. Herschel—and possibly a significant number of other people in his condition—was just a person who had no natural immunity.

But he did have his aluminum foil. Why that stopped the psychic commands Paul still didn't know, but it did. Paul intended to concentrate on that aspect of the power next. What he had now wasn't much use if you could block it that easily; he needed to learn how to punch through both foil and natural immunity to turn this passive ability into a real Power.

Herschel backed away from the window in disgust. He counted seven girls in there, all fawning over Paul as if he were Tom Cruise. It was obvious that he hadn't undone his original suggestion to Cyndi, nor was he content to stop with just her. Herschel's mind had been dulled from years of thinking everybody else's thoughts, and from years of cheap wine after that, but he could still see the direction Paul's experimentation was leading. It didn't take a genius to see that. Well, it wouldn't take a genius to stop him, either. All it would take was publicity. And Herschel knew just the place to go for that.

Bob was tempted to slam the door on the bum, but the guy's words stopped him cold.

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The bum—Herschel, he called himself—repeated his question. "I said, you want a *real* story for your paper?"

"Of course," said Bob, throwing as much skepticism into his voice as he could muster. Maybe the guy would go away if he called his bluff.

But he didn't. "Invite me in, then," Herschel said.

"Tell me what it's about first."

Herschel looked down, scuffled his feet on the door mat, then looked up again at Bob. "Psychic power. A real one. I can show it to you, but you gotta want me to first, otherwise the minute I take my hat off I'll wind up leaving."

"Huh?"

"I can read minds," Herschel persisted. "Trouble is, it makes me do whatever you want me to do. Right now you want me to leave, so if I read your mind now, I'll just have to go."

"That's the craziest thing I've ever heard."

"It gets crazier. Invite me in, and I'll tell you."

Bob hesitated. What if the guy had a gun? He took a good look at Herschel and decided he probably didn't. He'd seen this guy's type too often. If he'd ever had a gun, he would have pawned it long ago. What he did have, evidently, was a kooky story. Well, Bob was in the kooky story business, after all.

Shrugging, he loosed the chain and opened the door. "Let's hear it," he said.

Paul scowled at the departing reporter's back. He hadn't been fooled for a minute. From the *Times*, indeed. The *Times* wouldn't waste a phone call to check out a story about psychic research, much less send a reporter to check up on a "rumor." The man was from one of those damned tabloids, no doubt looking for someone in the field to make a statement they could use to lend legitimacy to one of their outrageous stories. Well he hadn't gotten anything from Paul. Paul had given him the tour, regretfully admitting that so far all his results had been negative.

The man had raised his eyebrows at Paul's bikini-clad test subjects, but he had evidently accepted the explanation that Paul recruited volunteers from the beach. Paul had tried to get *him* to volunteer, but the man had declined. The encephalograph obviously made him nervous. The suggestion that he try it had worked almost as well as putting him in a receptive state and controlling him would have. Paul doubted he would ever see the man again.

But he had evidently heard a rumor from someone, and Paul was pretty sure who it had been. He hadn't seen Herschel for days.

"Waitaminute. You're tellin' me this guy really exists? And he's got a D.O.D. grant?" The editor had his feet propped up on a desk piled to overflowing with papers, and he was waving Bob's article in the air as if he intended to use it to swat flies.

"That's right," Bob said. He sat straight in the plastic guest chair his editor kept just to make visitors uncomfortable.

"And he uses some weirdo psychic power to keep himself surrounded by bimbos all day?"

"That's right."

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"That's wrong. Unless Jackie Onassis is one of 'em, it ain't a story. The guy ain't a public figure, so without some kind of facts to back it up it's a goddamn libel piece. We publish this and your man, this—" he glanced at the manuscript "—this Paul Wilson guy, could sue our asses off. And with the D.O.D. behind him, you'd better believe he'd do it, too. So forget it. Lay off the guy. Stick to Bigfoot and Elvis and U.F.O.'s; they can't sue."

"But this is *real!*" Bob stood up and gestured wildly around him. "For once we've got a *real* story!"

"So take it to the *Times,*" his editor said, slapping Bob's article down on the desk beside his feet. "We're not in the market."

Silently, Bob retrieved his manuscript from the desk and left the office. OK, so they wouldn't print it. That wasn't his only option.

Paul sat in the exam chair, wires leading from his head to the encephalograph and from there to the computer. Before him the light flickered red and green, red and green as he matched his brain waves to the test subject's. The program led him through the different bands until he had a complete match, then beeped softly to let him know he was fully attuned.

That was the key to increasing the power of his commands. If he matched his own brain wave pattern to whomever's he wished to control before he had them attune themselves to Herschel's pattern, that extra matching seemed to strengthen the link considerably.

There was no one in the other chair. The trace was Herschel's, taken while he wore his foil hat. Paul was in no danger of acquiring Herschel's susceptibility to suggestion, but his mind was now focused on Herschel's. If he issued a command, Herschel would hear it, probably even through the foil. In earlier tests Cyndi had been able to receive through two layers of it when Paul tuned his mind to match hers.

Paul was alone in the lab. He had sent Cyndi and the other girls home for the day so he could concentrate on the one job he needed to do before he could relax and consider the whole affair a success.

Herschel, he thought. *Herschel, take off the hat. Take off the hat, Herschel.*

The light in front of him blinked red. His brain wave pattern had changed. Had he let it drift, or was it the result of making contact with Herschel? Was there some sort of feedback at work here?

He couldn't tell. He could only guess, and he guessed there was. *Crumple up the hat,* he commanded, afraid that Herschel would put it back on if he suspected what was happening. Even if he could still hear Paul through it, the commands would be stronger, more compelling, without it.

I want you to come to the lab, Herschel. Come to the lab now. Come alone. Don't tell anyone where you're going, and don't let anyone follow you.

He let his mind go blank, listening for any indication that he might be getting through. He had a hunch that he was—more than a hunch, really—but he couldn't be sure. Just to be on the safe side he repeated the command, over and over again.

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* * *

Sergeant Davis was just about convinced. He'd heard quite a few wild stories in his time on the force, and he'd learned to discount most of them without consideration, but even though this was the wildest story he'd heard yet, something about it made him listen. At first it was just the obvious sincerity in the street bum's voice and the fanatical intensity the reporter projected, but when the bum took off his tin foil hat and started telling Davis what was on his mind—literally—he couldn't help but think that something a little out of the ordinary was going on.

His conviction grew stronger still when the bum suddenly reached up to feel the top of his head, then, finding nothing there, snatched Davis's uniform cap off *his* head and crumpled it between his fists.

"Hey, what the hell you think you're doing?" Davis shouted, leaping up and retrieving his hat from the equally-astonished bum. "That's my *hat* you just ruined."

Herschel's eyes grew wider still. "I—" he began, then stopped. "I had to do it. *He* told me to."

"Who did?" Davis turned his wrath on Bob. "You? Did you tell him to do that?"

Bob shook his head frantically *no*.

"It's—" Herschel suddenly whirled around as if a giant invisible hand had grabbed him. "I can't tell you. I've got to go. You stay here." He lurched toward the door, but Sergeant Davis grabbed him and shoved him back into his chair.

"You aren't going anywhere until you explain why the hell you ruined my hat, buddy."

"I . . . can't," Herschel whispered. "Please, let me go." He stiffened, tried to rise, but Davis kept him pinned to his chair. Herschel strained against the arm on his shoulder again and again.

It wasn't until about the fifth time that Davis realized that the bum was having some kind of seizure. He wrestled him to the floor, shouting for the reporter to grab his legs, and together they immobilized him as best they could until the seizure stopped.

It took Davis a moment to realize that everything else had stopped, too. Breathing, pulse, muscle control—the whole routine. And nothing he tried could bring the guy back.

The backlash nearly got Paul as well. He awoke on the floor, the electrodes ripped from his head, the chair tipped over, and the encephalograph beeping insistently while it spit out a blank trace.

He staggered to his feet and switched off the encephalograph, and as he did he noticed the pile of paper on the floor. He had been out a while. He scanned through the paper until he found a waveform, then righted the chair and sat in it while he contemplated what it told him. It was the classic spike complex associated with grand mal epilepsy, but the amplitude was completely off the scale. And if it had been that violent in *him*, then Paul didn't want to know how bad it had been for Herschel.

He knew anyway. In that last moment of contact before unconsciousness, when the feedback had begun to build, he had actually seen through Herschel's eyes.

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Some part of him had actually been in Herschel's brain while the man died.

He knew where he had been at the time, too. He glanced furtively out the laboratory window, half expecting to see a dozen police cars drawing up to the curb, but the street was empty. It wouldn't be for long, though. Not after Herschel's final moments in front of a cop, and not with that nosey reporter there to explain it all.

He hadn't meant to kill him. He had only wanted to *control* him, to suggest that he forget all about Paul and the laboratory, but the police were unlikely to care what his intention was. Herschel was dead, and Paul had killed him.

But what could they charge him with? Telepathic murder? Not unless they could produce the murder weapon.

It was obvious what Paul had to do. Willing himself to be calm, he gathered up all the encephalogram traces from Herschel and the girls and himself and ran them through the shredder. He knew he had them all, because he was a methodical researcher and he always kept his files in order.

Next he wiped from the computer's hard drive the trace pattern files he had used for biofeedback comparison, and copied a couple dozen text files over the space where they had been so nothing could be recovered from it.

Lastly, he started formatting the individual backup diskettes. Cyndi's trace, Taffy's, Danielle's—all seven went where laps go when you stand up. The girls were still conditioned to like him, but there was no proof of anything in that.

He hesitated when he came to Herschel's disk. That one was the key to it all. Without the information on that disk, he would be unable to plant telepathic commands in anyone but the naturally receptive, and despite his earlier conviction that half the bums in the bus depot sported the ability, he had no assurance that was really so. He might never find another person who had it.

It was tempting. He could mis-label the disk, hide it in among a bunch of random data files, and it would probably never even draw suspicion. Probably.

Probably wasn't good enough to a guy facing a murder rap. He put the disk in the drive.

He hesitated. There was one other option: He could mail the disk to the Department of Defense. They would protect him, wouldn't they? And that way the secret wouldn't be lost. He thought about it for all of a second before rejecting that possibility as well. Power corrupts—if nothing else he had learned that from this whole business—and the Department of Defense was already powerful enough.

With a sigh, Paul formatted the disk, peeled off the label, and fed that to the shredder too. That done, he got up and went to the door to greet the police, and to show them the carefully kept records of his negative results. ■

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futures

Matthew J. Costello

The comic book community, once the bastard son of pulps and cartoon strips, has been striving for respectability. And, after some tumultuous times in the 80s, with breakthrough series (like Alan Moore's *Watchmen* for DC Comics) and local obscenity cases that put comic book store clerks on trial, the battle has—to some extent—been won.

There have been a couple of signposts pointing to a victory for this once most-disposable form of entertainment. Harlan Ellison wrote a thorough, thoughtful survey of the comic book world for *Playboy*. The media has continued to cover the "new" comics, spurred by the success of Frank Miller's existential, overweight, middle-aged Batman in *The Dark Knight Returns* (also DC Comics).

Even the normally dowdy *New York Times Magazine* chimed in with a piece on comic books, a piece that took a jaundiced view of the "adult" nature of today's comics. It ignored the successful Disney and Archie comics, while bemoaning the prevalence of violence and sex.

Perhaps nothing has changed the perception of Mom and Pop America more than the landmark Batman film. The tremendous publicity, followed by record-breaking box office sales, signalled that the days of Pow! Zoom! were over. Batman, in his dark, seedy Gotham, became what some of us knew he always was—a myth for our time.

And slowly, the public began to see comics as something not just for kids. The industry has responded with an attempt to ally itself with the mainstream science fiction. Eclipse Comics recently launched *Isaac Asimov's Science Fiction Anthology, Orbit*, featuring stories by Isaac and others. Marvel Comics is developing a number of projects, including an anthology devoted to the nightmare world of Clive Barker's *Hellraiser*. A SF anthology is also in the works, featuring many authors found in these pages. First Comics is not only reviving Classics Comics, but they've launched a series of glossy comics called First Fiction. First Fiction features 4-part original graphic novels, presented in graphic form.

A really striking anthology has just been published in the UK, and widely available in the US. *A#1* (Atomeka Press, PO Box 1585, London, NW6 1PW, England) is designed to showcase the best and brightest in the comic world. The first issue is an extraordinary debut, Alan Moore, Dave Gibbons, Brian Bolland, and others are represented. There's also an appearance by Bob Burden's quirky, Beckett-ish hero, Flaming Carrot, and an angst-filled look at the deepest thoughts of America's most powerful (and perhaps misunderstood) superhero—who will, for legal reasons, remain nameless. There's even a story from a 1942 comic, "The Return of the Purple Claw," which—when stuck in the middle of so many contemporary talents—takes on the form of

(Continued on page 155)

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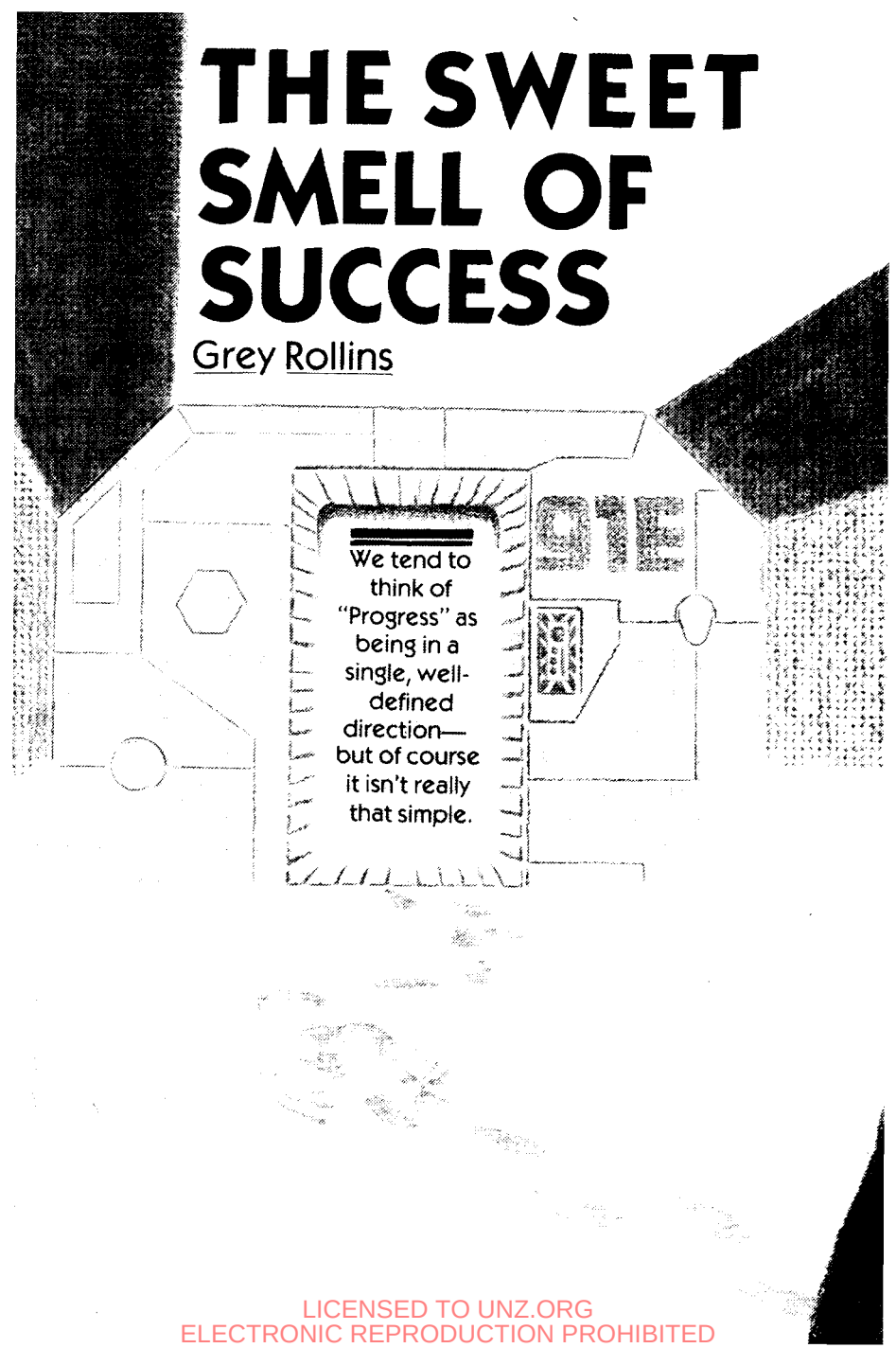
THE SWEET SMELL OF SUCCESS

Grey Rollins



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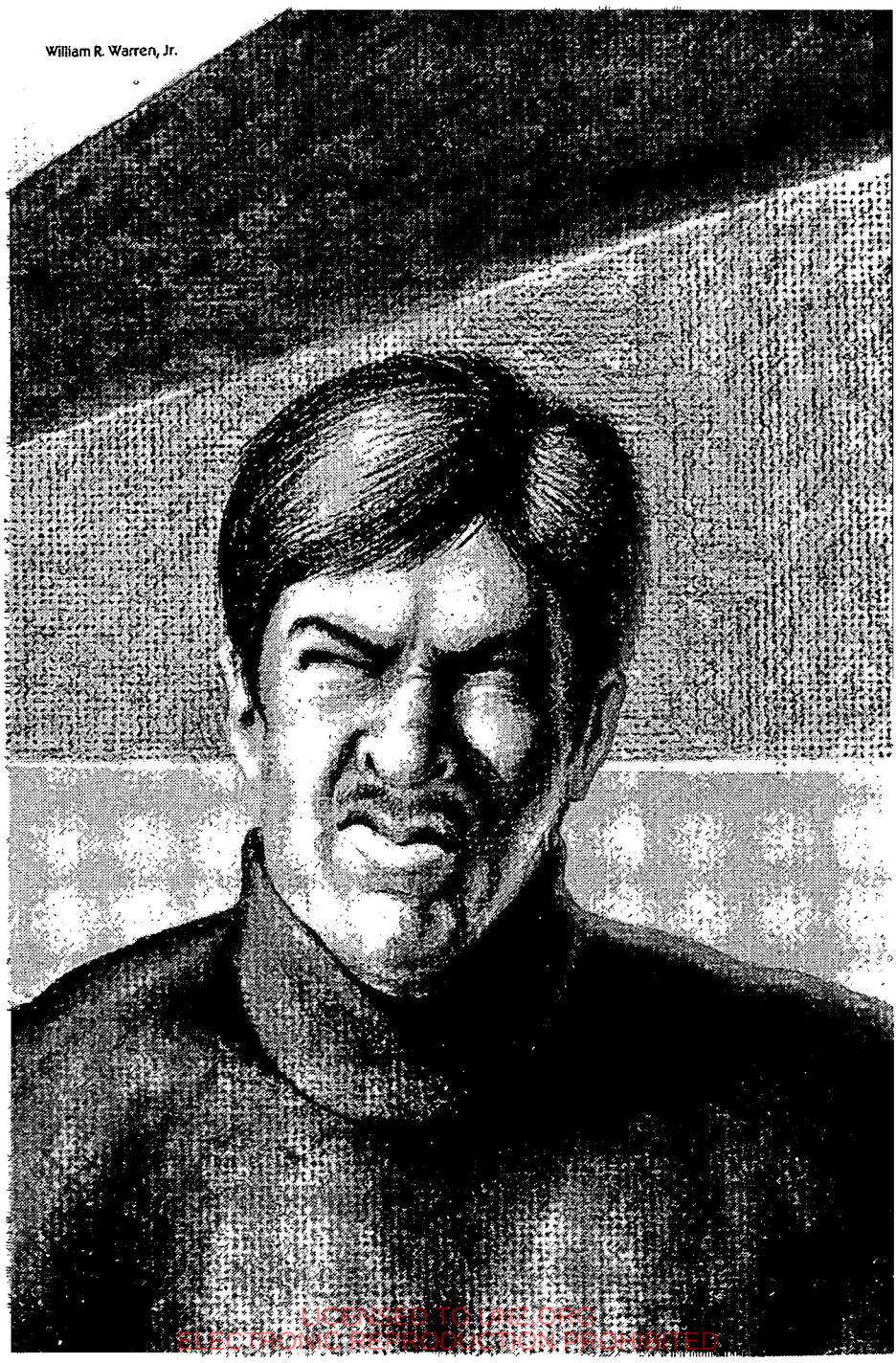

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The call came through on the private audio-only line of the Lunar division of Pfister Foods.

"Meekins, I see in the most recent market analysis that Amalgamated Foods's sales have reached almost 14 percent of the market, primarily at the expense of our Beef Delite."

Meekins closed his eyes and pressed his fingers to his temples. "Oh, God . . ." he whispered under his breath. He had known that this call was inevitable, but had illogically hoped that he would be summoned to the great board room in the sky before it came. Anything other than face the wrath of Phillip P. Pfister, the multimillionaire owner of the Pfister Foods conglomerate.

"Well?"

"Well what, sir?"

"Meekins!" came the imperative reply. "What are they doing with this product? Where is it coming from? What is it? Your report gives me virtually no insight into what is going on up there."

"Well, as you know, sir, Beef Delite is the Lunar division's name for the yeast-based product that—"

"I know that, you moron! All your products are just various flavors of yeast," Pfister bellowed. "I want to know what it is that Amalgamated Foods is doing to their yeast to take 14 percent of the market out from under us virtually overnight! Half of that loss within two months of the introduction of their beef-flavored product, mind you. How have they achieved that much market penetration in such a short time?"

Meekins sighed. He might as well get it over with all at once instead of dragging it out. "We don't know, sir."

"You don't know!"

"Not yet, sir, but we're working on it."

"Don't you have someone within their organization?"

"No sir, they are a family-owned company—"

"Meekins!"

"Yessir!"

"I want you to have a report on my desk by the end of this week telling me in detail exactly what they have done to their product to make it sell so well. I also want a detailed outline of what you intend to do about it." Phillip P. Pfister, also known as Philly, although only to his secretary, reached out and broke the connection. He grunted and swiveled his chair around to where he could see the couch across the room. He sat contemplating the long, smooth expanse of leg exposed by his secretary's short skirt for a few moments.

"Michelle?"

"Yes, dear?" she replied.

"Did I ever tell you that my son-in-law is a fool?" he asked.

"Yes, I believe you have mentioned that before."

"I have half a mind to go up there and look into this matter myself."

"Now, Philly, you know that you don't like space travel," she said, carefully not mentioning that his heart, overworked from years of pushing blood through his corpulent body, was the real reason that he could never go to Luna in person.

"Hmmm," he rumbled, every bit as aware of her tactful redirection of the

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conversation as she was. "I guess you're right. Besides, I think a quick trip to the Florida Keys would be a much nicer way to spend the next few days than going to Luna."

"Shall I call and have them spruce up the condo for your arrival?"

"Our arrival, my dear . . . you know I never go anywhere without you."

She knew.

Meekins fumbled through his desk drawer for the aspirin that he kept ready for the inevitable aftermath of his conversations with Phillip P. Pfister. As he did so, he mentally ran down the list of available options. The list was not long and most of them involved either quitting or being fired. Neither of these career paths appealed to him.

One of the few remotely viable options was to get his wife, Lucille, to intercede for him. She had always been able to manipulate her father in subtle ways that even Michelle could not successfully counteract. The main problem was that, while Phillip P. Pfister was subject to his daughter's cajoling, he was usually aware that he was being maneuvered. It would be all too telling for her to put pressure on him at such a crucial juncture. Also, she worked best when she had a little more time. To expect miracles by the end of the week was asking too much.

The really galling point was that Phillip P. Pfister was correct. There wasn't any excuse for him not to be able to outflank Amalgamated Foods in the marketplace. Pfister Foods had the clout to pull off anything they wanted to do.

He swallowed heavily as he gulped down the aspirin dry, shuddering at the aftertaste. Leaning back in his chair, he stared morosely at the plastic ceiling.

If only he had a laboratory where he could analyze the competition's product. Unfortunately, it had been decided that it was not worth the duplication of effort to set up a separate laboratory on Luna. Phillip P. Pfister always put his eggs in one basket—then watched that basket very carefully indeed.

It was an old battle that he had fought many times. He had sent samples of the competition's product down to Earth over a month ago, but they were so busy analyzing the output of their Earth-bound competitors that they had not yet gotten around to his request, or so they said. In all likelihood, they never would get around to it. He suspected that they simply threw away his samples as soon as they saw that they were from Luna.

How was he supposed to run his division properly without good intelligence?

Meekins's eyebrows shot up. Intelligence. Now there was a thought. With sudden resolve, he sat up. If he could not get proper backing from Earth, then perhaps he could handle the matter himself.

Albert Meekins spent the evening at his tunnel on the third level trying only partly successfully to parry his wife's questions. She sensed that something was up, but was unable to decide exactly what. His unusual decisiveness intrigued her; indeed, she would have found it a little difficult to believe that her browbeaten husband could muster such willpower had she had not seen it for herself.

When Lucille first met Albert, he had

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possessed a very aggressive nature. She sensed that he was a man on the move. That, and his curly black hair, had attracted her to him powerfully. She had hoped that his personality would be strong enough to resist the corrosive influences of her father. However, protracted exposure to Phillip P. Pfister had worn down his willpower to such an extent that he was now a mere shadow of his former self.

"Albert, why are you dressing like that?" Lucille Pfister-Meekins asked her husband.

"Like what, dear?"

"In that black jumpsuit."

Meekins, who had seen too many broadcasts of thrillers beamed up from Earth was, filled to the brim with romanticized ideas of spies lurking in the dark, clad from head to toe in black. "Well, Lucille, I was thinking this afternoon that it had been a long time since I had worn this suit and I thought that it might be a good idea to get it out and do so when I got home tonight." His excuse sounded lame, even to his own ears.

Irritated that he was evading her, she bored in. "With black underwear? I didn't even know that you owned a pair of black underwear!"

Meekins, knowing full well that he hadn't owned black underwear until just hours before when he had bought a pair on the way home from the office, decided to head matters off at the pass. He turned, seized his wife forcefully by the shoulders and planted a far more masterful kiss on her lips than she had felt in some time. "Darling, what you see before you now is the embodiment of a secret fantasy of mine. I have always wanted to be a spy and seduce the woman of my dreams . . . you!"

Eyes wide and her lips still tingling from his kiss, she stared incredulously at her hitherto unimaginative man. "My God, Albert, if I had known that this was all it took, I would have bought you an entire wardrobe of black years ago."

She pounced.

What followed, while highly pleasurable, was not exactly something that Albert Meekins had allotted time for in his plans that evening. Thus, he was almost three hours behind schedule when he arrived at the Amalgamated Foods complex. The problem was exacerbated by the fact that he felt worn out, tired, run down, and, as a matter of fact, wanted nothing more than to take a nap to restore his vitality.

Taking a deep breath, he squared his shoulders and walked down the corridor outside Amalgamated Foods's main entrance. Having deduced that it was highly unlikely that he would learn anything at the front door, he stood a moment and thought.

"Let's see . . . if I remember correctly, their tunnels extend in a southeasterly direction from here. What I need to do is take the next corridor that leads left and try to find an unlocked door," he muttered.

As he walked quietly down the corridor his thoughts turned to Lucille, sleeping peacefully back at the tunnel. Lucille had turned into quite a demanding little tigress after his hastily improvised scenario had backfired on him. He had expected derision—leading to her contemptuously ignoring him as he slunk out the door. What he had gotten surprised him to no end. His wife had

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unsuspected passions lurking deep within her. He would feel like a new man if only he could get that nap.

Shaking his head, he pulled his thoughts back to the present. If he got careless now, he would be discovered by some second-shift employee. The rank and file would not know him, but if they called in one of their superiors it would only be a matter of time before he was recognized. All the officers of both corporations were well known to each other. That could lead to an embarrassing situation indeed.

At that moment, five miles above Monroe, North Carolina, a private jet was hurtling south through the night sir. The tail fin bore the staggered triple P that marked every inanimate object that Phillip P. Pfister owned.

Michelle cocked her head back over her shoulder and looked out the view port at the crescent moon. "Philly?"

"Hmmm?" Phillip P. Pfister grunted from where he sat studying a sheaf of papers under a reading lamp.

"Do you think that Albert will be able to discover why Amalgamated Foods is making such headway in the market?"

He marked where he stopped reading with his fingertip and raised his head. "I honestly don't know, my dear. It doesn't really matter to me that much either way at the moment."

"If you don't care, then why have a Lunar division at all?" she asked, quite reasonably.

He rubbed his chin. "There's damn little profit to be made selling to so few people spread over so much territory; the distribution costs eat nearly all of the margin at this point. The only reason that I started a Lunar division so early was that I wanted to get name recognition. Trying to make an entry after the market becomes established will be far too difficult and expensive."

She sat silent for a few moments. "So for the time being, Albert is just a place holder."

"Exactly, my dear. As long as he doesn't run the Lunar division into the ground, I don't really care what he does with it. In the end, I'll take it away from him and put someone up there who has the right kind of mind to understand what needs doing. For the time being, Luna would be a waste of a good man. I intend to wait until the market is more mature before making any substantive moves."

Michelle's eyes took on a distinctive focus. "There's no reason not to make a profit now, is there?"

"Well, no, I've never been adverse to making a profit, Michelle. What's on your mind?"

"You could send someone to help him out. It wouldn't cost all that much and it would probably pay for itself, even if it only slowed Amalgamated down."

This was Michelle's true value to him. She had a knack for taking thoughts that had been rolling around in the back of his mind and crystallizing them in a way that made them seem simple and obvious.

A rapacious smile appeared on his face. "I'll wait until he asks for help. That way, he can't say I didn't give him a chance when I replace him."

Albert Meekins stared at the ceiling, dejected. He had padded, prowled, and

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generally been just as sneaky as he knew how to be and all he had to show for it was a dusty black jumpsuit.

Dusty, for God's sake!

Beside him, Lucille slept. He could hear her breathing softly in the dark; the covers rising and falling subtly.

He sighed and turned over. As tired as he was, he was still too keyed up to go to sleep. In his mind he reviewed his unproductive evening, wondering if there was something he had missed that would have given him the clues he needed to discover what Amalgamated Foods was doing.

The tunnel he had stumbled upon led back behind Amalgamated Foods at an oblique angle. It was obvious that it had not been used in quite some time because the floor was covered with a thin film of dust. This had surprised him greatly since pressurized space was an expensive commodity on Luna and here was an entire corridor going unused. On a deeper level, he was morally offended that a corridor anywhere in his city had been allowed to get that dirty.

He had walked down the featureless corridor trying to puzzle out this mystery. Head down and deep in thought, a strange odor had brought him out of his contemplation. Sweetish, not entirely pleasant, it was coming from a grill set high in the wall. It evoked elusive memories that he could not catch no matter how he tried.

The corridor ended not far ahead in a large steel plate with rivets as its only feature. The grill was the only feature visible anywhere in the entire corridor. He stared thoughtfully at the light coming through the grating for a few moments before turning back the way he came.

Now, in the dark, it was easy to see how he could have improved his chances of getting useful information. He could have taken along a piece of rope with a grappling iron at the end and climbed up the wall for a look, or he could have taken along a mirror on a long pole. Better yet, a video camera . . .

Meekins sighed. He was letting his imagination run away with him. There was no way he could have known ahead of time that he would need such an outlandish thing as a mirror on a pole. Not to mention the fact that he would have been more than a little conspicuous carrying such an item through the corridors.

No, he had done all he could have been expected to do under the circumstances. If only he could place that smell. Surely it must be an important clue.

Meekins rolled over once more, waking Lucille as he did so. She murmured something softly as she reached for him, her breathing already quickening and deepening.

He might not have learned anything about Amalgamated Foods, but he had certainly learned some fascinating things about his wife.

It was just past noon in Florida. Phillip P. Pfister lolled on an extra large, custom-made beach towel monogrammed with the inevitable triple P and savored the warmth of the sunshine on his ample belly. Michelle sat cross-legged beside him on a more conventionally sized towel, also mono-

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grammed, working the crossword puzzle in the morning paper.

"Philly, I need an eight letter word that means vibration of the chest. I think it begins with an f."

He reached down and rubbed some sand out of his navel while he thought. "Hmmm . . . try fremitus." He spelled it for her. "Specifically, it means vibration of the chest resulting from speech."

Michelle made a satisfied sound as she filled in the blocks. Then she looked up. "How is it that you know so many things like that?"

"I don't know, my dear. My mind collects odd facts the way that most peoples' pockets collect lint." He opened his eyes and shaded them with his hand as he surveyed her new bathing suit. "I like the color of that suit. It goes well with the color of your eyes." He carefully did not mention that he enjoyed the revealing cut even more than the color.

"I still feel like an idiot for forgetting to bring a bathing suit. I appreciate your buying this one for me this morning," she said.

"The least I could have done, my dear. After all, you were positively inspired when you came up with that idea about how to handle Meekins on the flight down."

She shrugged. "It just seemed silly to let Amalgamated take the Lunar market away without fighting for it, even if it is just a drop in the bucket right now."

Phillip P. Pfister dropped his hand and closed his eyes, watching the Sun glare red through his eyelids. "You're right, of course, my dear. I haven't been paying enough attention to Luna. I've let this Australian mutton deal take up far too much of my attention of late. It would be a shame if I let Amalgamated outwit me. That might set a bad precedent."

Knowing when she had fanned the flames of his competitive instincts enough, Michelle was content to give him one more nudge. "Philly, I'd be willing to bet you the string off of my bikini top that in ten years, certainly within twenty, Luna will be the most profitable division you have."

"Huh?" he grunted, startled.

"It doesn't take a lot to figure out that Luna stands a good chance of becoming Earth's gateway to the rest of the Universe, what with the lower gravity and such. I would imagine that a fair percentage of the freight that gets shipped through Luna will be food. . . ."

He leaned up on his elbow to look at her more closely. Sure enough, she had that look again. That was enough for him. Phillip P. Pfister laid back down and began to rethink his long-term strategy for Luna.

As fate would have it, the first thing that Albert Meekins saw when he arrived at the office the next morning was a fresh report on the market share that they were losing to the competition. It did not take long to digest the content of the report.

Afterwards Meekins sat depressed, having told his secretary to hold all calls for the next thirty minutes. His brain befuddled from lack of sleep, he was unable to reason clearly. His thoughts kept turning unbidden to the events of the night before. He had thought that

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Lucille would be content with just one encore to their performance prior to his unproductive trip to the Amalgamated complex.

Wrong.

She had proved nearly insatiable. At last, only an hour before he had to get up to go to work, she had let him drift off into an exhausted slumber. Now, facing the greatest crisis of his career, he was unable to function properly because his wife had a previously unsuspected fetish for the color black.

The rest of the day passed in a slow motion blur. Meekins felt as though he were watching the people around him through a pane of dirty glass—never quite able to focus on what they were saying or doing. At the end of the day he gratefully headed home, intending to eat supper as quickly as possible and get to bed early.

He had not counted on Lucille.

When he walked into their tunnel, his first intimation of trouble was when he smelled Lucille's perfume. There was a veritable cloud of it waiting for him as soon as he stepped through the portal. Then there was Lucille herself. Dressed in black.

It did not require a great deal of foresight to determine that, while he would no doubt be getting to bed early, it might be quite late before he actually got to sleep.

There were times during the next few days when Phillip P. Pfister actually considered putting Michelle in charge of the Lunar division. There were three reasons why he did not.

First, he knew that he depended heavily on her for many of the ideas that kept his business at peak efficiency. If she was not immediately at hand her effectiveness was diminished greatly. This fact had indirectly led to his divorce from his third wife, who could not understand why he kept such an attractive young lady at hand at all times. The second was that her business perception was somewhat erratic. It came and went according to some bizarre internal logic that even Michelle herself could not explain. Thus, she could not be depended upon. The third, purely emotional, reason was that he was quite attached to her.

However, the basic problem remained. When he got right down to it, he did not have anyone of sufficient caliber to take over the Lunar division. Oh, he could send Simmons, but then what would become of the Argentine beef sources that he had so carefully cultivated? There were similar objections to uprooting any of the half dozen division heads that he had in mind.

The root of the problem was that he had been thinking in terms of needing someone in about, say, five years. However, Michelle's pointing out of the long-term importance of Luna had unbearably accelerated his schedule to the point where he needed to start grooming someone for the position immediately.

Needless to say, Michelle's intuition picked this point in time to go AWOL. So, lacking a logical answer of his own, and unable to get an intuitive one from Michelle, he did the next most satisfactory thing—he called Meekins . . . just to make him miserable.

The scene was almost an exact duplicate of the phone call a week before

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except for the undeniable fact that Meekins was looking distinctly the worse for wear. A complete week of near sleepless nights was beginning to take its toll.

When the call came through, Meekins exhaled noisily, puffing out his cheeks as he did so. He punched the button to let Phillip P. Pfister into his life once more.

"Meekins!"

"Yeah?" he mumbled.

"Where is that report? I've been out of town at an important conference and I fully expected to see it as soon as I got back. Was there some difficulty in transmitting it, or did you have a confidential copy sent down here by courier?"

"No."

"What?" Phillip P. Pfister demanded.

"No," Meekins repeated, too exhausted to feel threatened by Pfister's tone of voice.

"What, pray tell, do you mean by 'no'?"

"No means that I didn't bother to write up a report, because I didn't have anything to tell you that you didn't already know. Somewhere down there is a copy of the most recent market analysis. If you've read that, then there's nothing of substance that I can add to it. We lost another one point something-odd percent over the last two weeks. In other words, the trend is accelerating. I can't do anything about it because I don't have a lab here and a glacier moves faster than your lab down there. I've been waiting for a report from them for over six weeks. I should have had it in three days at most." Meekins paused and took a deep, weary breath. "So the upshot is that I didn't waste my time writing a report that said nothing. That, in turn, saved you the time you would have spent reading it and finding out that I had nothing to report. That strikes me as good management—saving all that time."

Phillip P. Pfister was speechless. The idea that Meekins . . . Meekins, of all people, should suddenly start showing such a cavalier attitude towards him was more than he could take. Why, he would have bet a large sum of money that Meekins would have been one of the last people on his payroll to show such upstart behavior.

Meekins rubbed a hand over his face. He had shaved that morning, but his skin felt grainy. "All I can tell you is that I went over to Amalgamated and snooped around. The only thing I found was an empty corridor, which is very odd by Lunar standards, with a vent in it that smelled bad."

"You? You went over there, yourself?" Phillip P. Pfister croaked.

"Yeah. Well, you see, there was no one else I could send."

"But that's insane," Pfister gasped. "What if someone had seen you? They might have recognized you. Then all hell would be out for lunch!"

"At ease, at ease . . ." Meekins raised a placating hand, in spite of the fact that he could not be seen since there was no video transmission. "No one saw me. It was late at night and I was careful. Unfortunately, short of breaking into the actual plant, there wasn't a lot to be learned."

Phillip P. Pfister sat back in his chair, unable to decide what to do. Why, the

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fool could have blown the whole works if someone had discovered him. God, imagine the stink if they decided to publicize the mess! On the other hand, if he had managed to find something out, it would make it even harder to get rid of him when the time came. What had gotten into his son-in-law? Why couldn't he just keep muddling along the way he had been doing instead of risking so much for so little gain?

"Meekins, here's what I want you to do. Sit tight. Do nothing. Don't go near Amalgamated again. Got that?"

"Yeah, I think I can handle that. Nothing over there but a stinking vent, anyway." He twisted in his seat, trying to head off a muscle cramp in his back. "Can you do one thing for me, though?"

"What?"

"Lean on your lab down there. I want some test results I can chew over during the weekend."

After the shock of the way that Meekins had been treating him, it didn't even faze Pfister that Meekins had turned the tables and was making demands on him. "I'll talk to them," he managed to choke out.

"Thanks. I'm getting a little tired of trying to run the Lunar division without any kind of information about my competitors. You can be certain that they know everything about me."

"Meekins, on no condition are you to stir out of that seat. And I certainly don't want to hear any more of this . . . this . . . *bullshit* about empty corridors and smelly vents. Do you understand me?"

"Yeah, sure. Just see if you can get your lab on the ball, will you? I need that information yesterday."

Phillip P. Pfister, unable to reply coherently, reached out and slapped the disconnect switch.

Meekins leaned back in his office chair, instinctively reaching for the drawer where he kept the aspirin. Half way through the motion, he stopped. He had no headache. For the first time in memory, he did not have a headache after talking to Phillip P. Pfister.

The enormity of the realization took a while to sink in. He had taken what should have been a very stressful call, with all the advantages on old man P's side, and fought him to a standstill.

He pushed the drawer closed again and walked out to where his secretary was sitting. He seized her by the shoulders, picked her up bodily, kissed her on the forehead, and placed her back in her seat.

"If anybody calls, tell them I'm in an important meeting and I left instructions not to be disturbed. I'm taking the rest of the day off," he told the thunderstruck girl.

Whistling merrily, he walked out.

Michelle considered calling Phillip P. Pfister's mother. She considered calling his second ex-wife; the only one he was on speaking terms with. She considered calling a doctor. She considered calling . . .

She did none of these things. Instead, she sat quietly on the couch and watched while her boss raged. She wondered what on earth she could do to get him calmed down. She was terribly worried that if he didn't calm down soon he would have a heart attack or something

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equally disturbing. Never before had she seen him so out of control.

In the end, the thing that brought Phillip P. Pfister back to reality was the look in Michelle's eyes.

He was in mid-rant when he noticed. Too much the pragmatist to throw away what was invariably good advice, he stood stock still with his fists clenched at his sides and practiced deep breathing for a full thirty seconds before he asked her for her pearl of wisdom.

"I think you should let Albert keep the Lunar division. He seems to be taking a more aggressive attitude," she said as off-handedly as she dared.

He nearly did have the heart attack she feared.

Lucille lay spent, tangled in the sheets. Breathing deeply and slowly, she summoned her energy and raised her head to look over to where Albert stood nonchalantly selecting a fresh jumpsuit. Gone were all traces of the tiredness he had been complaining of the past few days.

"My God, Albert, you've never come home in the middle of the day before." She paused, then said dreamily, "And you've certainly never . . . ravished me that way before."

A wicked grin and a devil-may-care shrug were his only reply.

"And you weren't even wearing black," she added wonderingly.

"I feel like a new man. I stood up to Pfister and it scared him a little bit. I think it made him mad a lotta bit. Furthermore, I think I know what Amalgamated is up to."

Lucille sat up in the bed. "You talked back to Daddy?"

"You bet. It's been a long time since I gave him anything but total obedience. Too long, I think." He turned and gave her a sidelong look, noting with approval the near perfection of her body where the sheet had fallen off when she sat up. He tossed the jumpsuit he was holding into the nearest chair.

As he came towards the bed, his intentions obvious, Lucille asked, "What has gotten into you?"

"No, my dear, you phrased that improperly. It's more a question of what's about to get into you."

An hour later the phone rang in Phillip P. Pfister's office. The one that never rang. It was the line to Luna. Phillip P. Pfister mopped his forehead with a silk handkerchief and stared at the phone as though it were a malevolent beast. "You answer it, Michelle. If it's that abomination of a son-in-law of mine, tell him I'm not here."

From where she sat perched on the edge of his opulent mahogany desk, she made a long reach and snagged the phone with her fingertips. "Hello?" she said, nearly as amazed at its having rung as her boss.

"Michelle, this is Albert. Let me speak to the boss man." His voice exuded self-confidence and power.

"Don't talk about him that way. You've got him terribly upset."

"Sorry about that, sweetheart," he said, not sounding particularly concerned. "Let me speak to him anyway."

"He's not here right—"

Meekins didn't even let her finish. "Sure he is. I know it and you know it, so let me talk to him." He paused

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for a moment. "Tell you what, if he gets mad about it and fires you, I'll hire you up here. I know what you're worth to him in terms of ideas and I'll give you a 10 percent raise right off the bat."

"But . . ."

"I know he's listening. Don't bother replying. It's just insurance in case you're worried about your job."

"Uh, but . . ."

"I know—what if he fires me, too? I won't be in a position to give you a job, right?"

"Well . . . yes," she said hesitantly.

"Don't worry about that either. He won't fire me," Meekins replied casually. "He doesn't have anyone to replace me."

"How could you know that?"

"Elementary, my dear Michelle. If he had someone, he would have replaced me a couple of hours ago. Now let me talk to him."

Reluctantly, she turned and handed the phone to Phillip P. Pfister. He accepted it with even greater reluctance.

The conversation did not last long. Michelle watched Phillip P. Pfister's face go from an expression suitable for a mouthful of alum to one where he was smiling, albeit weakly.

He handed the phone back to Michelle. "He wants to talk to you again, dear."

"Yes?" she said into the phone.

"Michelle, I'm aware that you have, shall we say, an intuitive approach that cannot be duplicated. I need you to research a problem for me and let me know which of several avenues feels best to you." It took several minutes to explain, during which time her expression changed to one of incredulity.

"You're kidding! Please tell me this is a joke!" she demanded.

"Never more serious, my dear. That's what Amalgamated is doing, and we're going to match them, bite for bite, kilo for kilo."

"But how do you know that's what they're doing?"

"Actually, it was a chance remark that the big P made." He paused for a moment. "You're aware that I lived in Miami until I was ten or so?"

"Well, yes, but what does that have to do with it?" she asked.

"My parents immigrated to Luna when I was just a boy. There are a lot of memories that are pretty vague by now; after all, that was over twenty years ago. That in combination with the fact that I was a city boy conspired against me. When I went snooping around Amalgamated, I found a vent that had an unpleasant, vaguely sweetish smell coming out of it. I couldn't remember what that smell was for the life of me. I knew I had smelled it before, but it just wouldn't come into focus. When the boss man was yelling at me a while ago, he said, and I quote, 'bullshit.' "

"So you're saying—"

"Exactly. That odor coming out of the vent was the odor of cow manure—a smell I hadn't come across in years. They put the vent at the end of a long empty corridor so that the smell would have a chance to dissipate somewhat before it got to where anyone would smell it."

"But . . ."

"Michelle, they gambled that people would buy real beef over a yeast-based substitute. They were right, so we're

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going to grow cattle up here, too. Start-up costs be damned, the sales are justifying it. That's why I want you to research the various beef cattle breeds for me. I need to know if there's one particular breed that strikes you as being more suited than the rest for the special environmental problems that we have up here."

"My God, Albert, you really are serious!"

"You can bet your shoes on it. I'm going to beat them at their own game. Bye," he said, and the line went dead.

Michelle turned to Pfister, still holding the phone to her ear. "I think . . ."

He held up a hand to forestall her. "I know, I know, you told me to let him keep the Lunar divisison. You were, as usual, right, but that doesn't mean that I have to like it. Just give me a little while to get used to it."

Her eyes clicked into that special look. "You know, if beef is going over that well, maybe we should try something like real sun-ripened tomatoes. After all, there is a great deal of sunlight up there. . . ." ■

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ELIZABETH BEATTY
SUBSCRIPTION MANAGER

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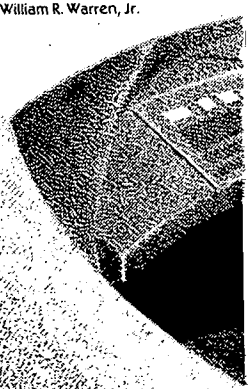
Can a job be done *too* well?

TONGUES IN TREES

Ray Brown

William R. Warren, Jr.



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The instant Doug Mehl's ship twitched from hyperspace back to the gravitationally twisted geometry the galaxy called "normal," a bell in the console pinged to warn him of an approaching missile.

Mehl sweated, shivered, cursed, and reached for the tracker, but before he could swing the studded eyepiece down he heard the shield generator humming. Since he was still alive, he concluded that the shield had worked.

In more than forty years on the job, this was the first time such a thing had happened to him. That there was a prescribed procedure he remembered clearly, but just exactly what it was eluded him for a moment. He shrugged, bumping his shoulder painfully against a bulkhead that housed some of Elsie's new data, and activated the tracker anyway.

There were more coming. Fortunately, they could be outrun.

He punched a course into the console and zoomed elsewhere, leaning back in his couch, breathing deeply, clutching at calm.

He explained to himself that he had never really forgotten that an attack was possible, but that he had merely stopped thinking about the possibility during the long, calm, scholarly years of baby-sitting the goddamned Linguistic Computer and watching it test new species for sapience.

He had trouble buying his explanation. Thirty years ago, when one of the galactic Thing's treaty-teams had discovered an enslaved and intelligent race of symbionts, and an enraged, righteously indignant race of masters had ripped ship, Elsie, and lingtech to bits with their bare claws, the news had scarcely fazed him. Little by little, the war-gear had become just so much equipment on the maintenance schedule. He had been remiss.

Hostility was just too uncommon, that was the problem. The incalculable increase in wealth that Thing membership brought a new planet made even the most consciously oppressive native races cooperate. Besides, most contact-species weren't consciously oppressive—they simply didn't know. After all, it was easy for Thing members, with lots of experience of alien intelligence, to recognize the possibility where native races couldn't.

But the ships weren't armed and shielded for nothing. Sometimes not even the wealth of the Thing was enough to shake the natives' commitment to the status quo. Sometimes when a treaty-team called in a ship like Mehl's to test a likely candidate for intelligence, the dominant race—stupidly—tried to stop the test by killing one of the examiners. That, Mehl concluded, must be the case here on Ngeirde. The Ngeir must be knowingly suppressing the—what was it the message-capsule to Earth had called them?—the Tseep. Yes. The capsule hadn't said anything about it, but the Ngeir must know that the Tseep were intelligent. After all, if they had nothing to hide, why shoot at him?

His fear turned to anger and he whacked viciously at a series of keys. The screen sizzled to life. A noseless, pale, rubber-lipped face began to burble at him and he flicked a switch on a small, detachable part of the console.

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" . . . and are now well out of range," the voice of the Linguistic Computer said. "You need no longer retreat."

"I'm not retreating," Mehl said. "I'm putting the ship into synchronous orbit over the Thing post, where they can keep a close eye on me, trace any new missiles back to their source, and bomb your goons to hell."

"You have a wrong idea! I am a member of the government!"

"So what?"

"Those missiles must belong to the Tseep Protective League."

Mehl felt confused for a moment—out of touch. For the millionth time, he wished there was some better method of transmitting information through hyperspace than launching message capsules.

"Bull!" he said at last. "The Tseep Protective League is the complainant in this case—I know that much, at least!"

It seemed to Mehl that the Ngeir was laughing. Elsie confirmed it.

"What's so funny?" Mehl asked.

"The idea of the League asking for a Linguistic Computer! No Ngeir knew the Thing possessed such a machine when the League made their claim that the Tseep are intelligent—else they certainly would not have made it! Their claim is a fraud, the League a band of criminals, and when the Thing deigned to tell us about your machine, *we* were the ones who asked the treaty-team leader to call you in—in order to prove it."

Mehl frowned. The story hung together up to a point. It was true, for instance, that the Thing would be unlikely to tell the Ngeir about Elsie unless she was needed—the galactic Thing didn't give away much free information. But . . .

"You're telling me the League is entirely a *Ngeir* organization?"

"I am."

What could a Ngeir hope to get out of such a fraud? It would only delay a treaty that would be of enormous benefit to the whole race. It didn't make sense.

"Ask Colonel Chisolm, the treaty-team leader, if you do not believe me," the Ngeir added.

Why, Mehl wondered, with all the billions that had been invested in improving Elsie, couldn't they come up with the few extra ounces necessary to make her do contractions?

"I will," he said aloud.

"And must you really park your ship above the Thing post? It has already been arranged for you to land near a Tseep village we have picked out."

"Afraid so," Mehl said. "I'm taking a boat down. Elsie is built into the ship, and I'm not risking her."

Or Doug Mehl either, Mehl added to himself. He'd land the boat at the Thing post, where Thing soldiers could cover him.

The Ngeir flopped his arms in a gesture that Elsie interpreted as puzzlement.

"Oh!" Mehl said, detaching the box from the console and holding it up to the screen. "I'll communicate with Elsie by means of this thing—unless your Tseep village isn't in range. It won't be in range, will it?"

The Ngeir stared at Mehl a while, and Mehl realized that Elsie had successfully translated either the odd phrasing of his question or the hopefulness in his voice.

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And what of it? If there was some sort of justification for leaving Elsie out of the investigation, why shouldn't he take advantage of it?

While the Ngeir fumbled with charts, Mehl relived his favorite moments from the single occasion, seventeen years ago, when he'd had a chance to use his own expertise.

The creatures had communicated by touch, and Mehl had proved it. It had taken six months, but in the end he understood the language well enough to arrange a trade agreement. His only regret was that the incident had inspired the board to provide Elsie with tactile pickups, thus reducing even further his chances of doing something like that again.

It had been a glorious half year, and ever since, he'd been hoping for another such opportunity. He had studied. He had competed with Elsie, often arriving, however intuitively, at the correct answer before she did—and never, in the past decade, had he come up with an answer different from Elsie's. He was good. He knew it.

"No," the Ngeir said, "but there is another Tseep village in range. The only problem is that we will have to travel a fair distance on foot."

It wouldn't have made any difference anyway, Mehl realized. The board would have expected him to make recordings and transmit them to Elsie later. Was a whole new type of communication his only hope?

"Doctor Mehl?"

"Sorry," Mehl said. "Wool-gathering. The new village you speak of will be fine. I'll be down in a few minutes."

Mehl stared at the face in the screen, wondered if it was the face of a liar, and prayed it wasn't. If the Ngeir was telling the truth, the situation on-planet had to be very odd, indeed, and perhaps somewhere in that oddness he might yet find a legitimate reason for being more than just the gofer for the ultimate authority on language.

Shih, the Ngeir overseer he'd talked with on the ship, was generally humanoid, though his midsection lacked nipples and grew what seemed to Mehl odd patches of hair, redeemed aesthetically only by being bilaterally symmetrical. Mehl was able to study Shih's short, thick body because the native wore only a felt hat and a pair of shorts against the near-freezing temperature of the northern forest. Shih, in turn, seemed fascinated by Mehl's parka.

The box from the console now swung from Mehl's belt as they hiked along side by side, and its controls still kept Elsie demoted to the simple job of translator, turning the bubbling flow of Sengeirji into Thing Inter and vice-versa.

"You understand," Shih was saying, "that if language is going on, it could be well above the normal register. The Tseep are very high-pitched."

"That's all right," Mehl said. "Elsie hears all pitches."

"Or the League might claim that it is harmonics."

"Like the Great Plains rats of Al Nair Five," Mehl said, nodding. "Elsie knows all about that sort of thing."

Shih had been going on in this vein for quite a while, and Mehl's answers were coming so automatically he was scarcely aware of what he was saying. Most of his attention was focused on

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Colonel Chisolm's hips swaying in front of him. Chisolm had turned out to be gorgeous—a smooth-skinned, pixyish brunette who had to be near his own age, judging from the kind of Inter idiom she used. Seventy, at least. Too bad she only thought of him as an inconvenient duty—everybody knew those army chicks screwed like minks.

It struck Mehl that there was an element of juvenile fantasy in that last thought that didn't go well with his seventy-one years. The three solo weeks from Earth to Ngeirde, he realized, had made him crazy. Maybe he should age his gonads again.

He tried to concentrate more closely on what Shih was saying.

" . . . or some other kind of signalling entirely. Visual, perhaps, or . . . "

"Please be assured," Mehl said, "that Elsie can handle any and all types of linguistic communication through any sense, including senses you and I don't even have. She's got a brand new, vastly larger data bank, now. Where she used to have only a few tens of thousands of language to make comparisons with, she now has over a million."

"I am sorry to hear it. The results of a test made by a new, untried machine might be subject to attack."

Mehl pulled a roselike flower from an overhanging branch and suddenly believed, in his gut, Shih's claim that it was summer.

"Elsie's modifications were designed by the same computer that's been working on her all along," he said. "You have nothing to worry about but the fact that when Elsie is called in, she finds language 60 percent of the time."

"It's usually the treaty-team that calls her in, doc," Colonel Chisolm yelled back at him. "Not a bunch of crooks!"

"That is correct," Shih said. "And I worry about your machine because we want to make it absolutely clear that the Tseep speak no language—as I am sure you will understand immediately on seeing them. Admittedly, they are highly social, organized animals, but then so are the ants of your own planet, I believe."

"It's no good trying to convince *me*, Shih," Mehl said bitterly. "I'm just a goddamn button-pusher. I make sure you don't substitute a ringer for the Tseep. I polish Elsie's panels. Elsie's the boss."

"Sounds like time to change jobs, doc," Chisolm said.

"Oh, I like my job OK," Mehl said. "It's just that there are people who are qualified. Translators are cheap, but the analysis stuff, the heart of the linguistic computer, that's very expensive, and when you've already got the people who are qualified. . . . " He let his voice tail off.

"Qualified for what?" Chisolm asked.

"Never mind," Mehl said. He turned on Shih. "Why do you care so much, anyway?" he asked the Ngeir. "You'll get trade agreements with us eventually—a few years later if the Tseep are sapient and we have to work a new signatory into the deal, but eventually."

"We need that treaty quickly," Shih said, lips tight with urgency. "In the past two years of negotiations the Ngeir have developed high expectations. The wealth that will come to us with membership, little though it may seem to you, means everything to us."

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Mehl watched a large, caterpillarish creature scaled with glittering pink hexagons wind itself ecstatically around a green-skinned bough.

"You seem pretty rich to me," he said.

Colonel Chisolm made a rude sound.

"Such easy philosophy does not become you," explained Shih. "We must have access, and soon, to the life-extending, invigorating drugs we can only get from the stars—because now we have seen their effects on you Thing members. We want to join you in this wonderful adventure you are having—this exuberant rush outwards into a thousand strange places. We cannot stop ourselves from thinking about it. We expected to sign the treaty in just two weeks, and a suddenly imposed delay of several years will be hard on us. I tell you, many of the highest here would gladly sign themselves into slavery for a chance at what you have."

Mehl understood, but the way Shih put it only aroused his suspicions. Those missiles still had not been explained to his satisfaction—when he'd landed, Chisolm had simply insisted that the Ngeir government was right and hurried him into the woods. Slavery still seemed like a reasonable explanation.

Of course, his natural inclination to see intelligence everywhere made him sometimes over-suspicious of contact species. He'd have to guard against that. He remembered, as a boy, making a hero of the judge who had decided that one sapient race had no right to enslave another even when that enslavement was necessary to the survival of the race of masters. He got too excited, perhaps, by the possibility of undiscovered intelligence, and too horrified by the possibility of its oppression. He tended to see both possibilities everywhere, worrying about races that must inevitably be lost in the Thing's language-biased sifting process. . . .

Firearms clapped somewhere in the tree-covered distance.

"One of Shih's boys has found a League member," said the Colonel. "Or vice-versa."

"Pardon?"

"They're still gunning for you, doc."

"Do you mean the League is gunning for me, or Shih's boys? I still haven't heard the League's side of it, remember. In fact, I haven't really heard your side of it."

Chisolm laughed. "You think we're leading you out into the woods to finish you off? Mindwipe you and feed Elsie false data? Something like that? What would that make me?"

"You're the head of the treaty-team," said Mehl. "You wouldn't be the first in such a position to be corrupted." He let his hand wander closer to his holster.

"You're right, doc," she said, her voice sounding friendlier. "You're right to be suspicious. But . . . well, we're almost to the Tseep village now. Don't be too disappointed when Elsie shows you Shih's right."

"I can understand Shih's closed-mindedness, but I can't understand yours." *God! I'm doing it already!*

"Hey, I'd like for the Tseep to be intelligent," said Chisolm. "New ideas always mean a profit for the Thing somewhere down the line. But I've been here two years and I know some of the Ngeir in the League. Crooks. They're playing with the planetary bond mar-

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ket—pharmaceutical companies, mostly."

Mehl thought about it. Drugs would be the first item the traders would bring in, so the price of those bonds had probably plummeted in anticipation of the treaty.

"They bought the bonds low," Mehl guessed. "Is that right? And then they claimed the Tseep were intelligent to delay the treaty so the price would go back up?"

"Right. Since they didn't know about Elsie, they thought our investigation would take years."

"Thus," said Shih, "they fire missiles at you and try to shoot you here in the forest. As long as they can keep you and your machine from the Tseep, they can avoid being jailed."

"How?" Mehl asked.

"Unless their claim is proven false, how can a court convict them of fraud?"

"Hm. I've heard of crazier legal principles. But that's just fraud—what about the people in the woods who are supposedly trying to kill me?"

"Ah. Those I can arrest, perhaps . . . if I catch them."

"We're here," the colonel said.

Chisolm flung her arm out ahead of her towards where the path plunged into a hollow. Over the top of the bank rose the head of a Ngeir, then the shoulders. As more appeared, Mehl saw that his hands were tied behind his back and that he was followed by yet another Ngeir holding the end of the rope.

"Meet Blauth," Chisolm said. "Vice-chairman of the League."

"I have committed no crime!" said Blauth.

"Attempting to avoid interrogation by an agent of Overseer Shih," said the Ngeir behind Blauth.

"A crime for which a ticket is customary," said Blauth. "At any rate, I have committed no other crime."

"You will have, very soon," Shih said gleefully.

Blauth shifted his feet and chewed nervously on his left shoulder-tuft. "Since I can no longer be said to be avoiding interrogation," he said, "interrogate me. Or let me go."

"Why did the p'pubh cross the road?" Shih snarled.

"Also," the other Ngeir said, "before I attempted to interrogate Blauth I observed him training a rifle on a spot where your path meets the Tseep village. He threw the weapon away while I was chasing him."

"May I not hunt in peace?" Blauth demanded.

Shih snorted. He held out his had insistently and his agent placed the rope in it, then disappeared back into the woods.

A little way further down the slope Chisolm stopped and pointed again. Mehl's eyes followed her finger towards the top of some sparsely-leaved, thick-limbed trees on the other side of the narrow valley. As far as he could tell, he was looking at the sloped, glistening roofs of a city of nearly cubical tree-houses.

"There they are, doc," she said.

"I wish to God," Mehl said, "that you'd quit rubbing my lack of education in my face."

"You mean calling you 'doc'? I didn't mean anything—"

"I could have gone on, earned post-

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doctoral degrees, but that would have put me behind a desk, and I like field work. . . . or at least I used to. And, I might add, I've learned more in the field than those fatasses on the board ever—''

''You don't need to yell,'' Chisolm yelled.

She'd had to yell, Mehl realized. She couldn't have been heard otherwise. His face felt hot from anger and he suspected it would stay hot for a while, from embarrassment. What had gotten into him? All day he'd felt on the verge of losing control—as if Doug Mehl were a cranky, irritable neurotic he had to watch every second. And now he'd lost it. Had those missiles literally scared him silly?

''Sorry,'' he said. ''Just call me Doug, or Mehl, or something. You were telling me about those houses?''

''About four feet on each side,'' the colonel said coldly. ''Loosely wattled sticks and grasses, with some kind of slick Tseep body extrusion added to the roofs. You'll see doors and windows when we approach from below.''

''Just when Blauth's about got me convinced that this really is fraud,'' Mehl said, ''I see what looks like pretty good evidence for Tseep intelligence.''

''I don't know about that. Are they houses or nests? They're all pretty close to identical. Bear in mind that Blauth's bunch would naturally choose the most likely-looking animals on the planet.''

''I am misunderstood,'' said Blauth.

''Then you are no doubt eagerly anticipating the coming test,'' said Shih, giving the rope a little tug. ''At which point, our folly revealed, I will untie you and we will all be pals.''

By and by they crossed a creek and the path began to curve up again. Mehl saw the ''doors'' and ''windows,'' which turned out to be crudely gnawed holes.

Then he saw his first Tseep.

He ducked.

''Watch out!'' Chisolm said. ''They're gliders, and they're playful. They're only trying to buzz you, but a gust of air can smack them into you sometimes.''

The Tseep landed with a plop next to Blauth, who smiled at it and tried to pat it on the head. The Tseep jumped away and scurried back to its tree with its winged arms folded in—which left it another set of arms for climbing. It turned to them and waved something between a hand and a claw before it climbed back up the tree to its house.

''Tseep!'' it said.

Mehl gritted his teeth. There was a buzzing, a burr, a something in the high-pitched squeal that jarred inside his head. Chisolm looked pained, too.

Maybe it'll blow something loose in Elsie's box, he thought, and hopefully turned the input-volume up and checked the mike. It was too much to hope that it might blow something loose in Elsie herself—but maybe that burry quality in the tseeping carried information somehow. Elsie might not be equipped to analyze that.

Then he took stock of the Tseep physique and felt his body slump. Its body was as discouraging as its nest.

''Is that an adult?'' he asked.

Chisolm nodded.

It was less than two feet high. Its head, which was smooth and lacked the short brown fur that covered the rest of

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its body, was streamlined in shape. Its skull size was theoretically above the lower limit for possible sapience, but in forty years Mehl had never seen positive results with a brain that small.

Another Tseep crawled out of one of the holes. The first Tseep waved at it and rattled Mehl's sinuses again. Chisolm reached into a breast pocket, produced a couple sets of earplugs, and silently offered Mehl a pair. He accepted gladly.

They didn't do much to take the edge off—especially when other Tseep began appearing in other trees, adding their squeals.

"How much data does Elsie need to decide the question?" Chisolm yelled. "How long will this take?"

Mehl began unhooking various sensors from his belt and placing them where he figured they'd do the most good, saying, "Not very long at all, I'm afraid. And it'll speed things up even more if everyone shuts up after I switch Elsie from translation to analysis."

Everyone nodded understanding. Mehl pushed a button marked AN, and they all sat on a fallen trunk and waited.

For a few minutes, right at the beginning, Mehl saw a sign of hope—that burry quality fluctuated in a way that might be carrying information. But it didn't take long for him to give up the idea. The fluctuations were regular, repetitive. He watched the Tseep for gestures, but there was no hope there, either. They had two. They waved, and they swung their winged arms about themselves like Dracula wrapping himself in his cape. That was it.

Randomly, the dials for the sensors flapped once in a while, picking up . . . God knew what, but nothing to do with the Tseep.

The Tseep had no language. It was as clear a case of thumbs-down as Mehl had ever seen.

What was taking Elsie so long?

At last the box beeped, signalling Elsie had heard enough. The two Ngeir began to burble at him and he didn't need a translator to understand what they were asking him. He was reluctant to answer, though. His brain raced, trying to think of what to tell them.

Elsie had decided the Tseep had a language.

She was wrong, Mehl knew. Forty years of experience told him so. But he had done all the routine checks on her right before he'd twitched out of hyperspace. She'd been OK then, and that meant that whatever was wrong with Elsie's was something deep—maybe in the hardware itself. They'd modified her some, after all—they'd had to, to get her to handle all those new languages. Of course, he'd make those routine checks over again, just to be sure, but the probability was that whatever was wrong here was something it might take years for the board to straighten out. Years of unjust delay.

And that was assuming the board would believe that there was something wrong with Elsie. If they didn't, they'd waste even more years sending a new team out here and trying to communicate with these overgrown flying squirrels. All the time, Ngeir, whose lives might have been prolonged with the drugs a trade agreement might bring, would be dying.

He had always rejoiced at a positive finding before—but Elsie had never

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been wrong before! Now he saw the misery a "yes" could cause for the contact-race, and suddenly his tendency to see intelligence everywhere he looked seemed puerile. A game. A stupid fantasy—safe, because Mamma was always right.

Here's your opportunity, Mehl.

He switched the box back into translation mode.

"Elsie says the Tseep have no language," he lied.

The walk back to Chisolm's APC was hard. Blauth began it in panic, alternately butting Shih and tugging frantically at his leash, trying to escape. When his panic died down, he tried to brazen it out.

"Why," he demanded of Mehl, "should you assume that because a creature has no language it lacks intelligence?"

"I don't want to talk about it," Mehl said.

"It's a real problem," Chisolm said, regarding Mehl with a sympathy he didn't appreciate right then. "You've got to be able to communicate with something before you can prove it's smart, and we can't go around assuming everything is smart. We can't just order the whole galaxy to convert to vegetarianism."

"I was not talking to you," hissed Blauth. "I was talking to this . . . "

Elsie hesitated a split-second longer than normal before translating, " . . . tongue depressor."

"What," Mehl said flatly.

"Your machine does not even establish the fact of language. The idea that the languages of the universe can be discovered by a set of rules in a computer program is laughable!"

"Indeed it is, Blauth," Mehl agreed, voice tight. "Which is why we don't use that approach. Languages are totally arbitrary in their structures—capable of almost any kind of weirdness. You're right. Nevertheless, they do *have* structures, and Elsie looks for them."

"How can it look for them without some preconceived principle?"

"Don't use your own primitive computers as a basis for judging ours," Mehl said, hating himself. "Elsie analogizes, and she has over a million different languages from thousands of different species to base her analogies on."

"That which looks for patterns must have some idea of what a pattern consists of."

"Ah! Now I see what you're worried about, in your great concern over the Tseep! It's true that Elsie is a human-designed computer, but our new model takes that into account. There are quite a few languages. . . ." Mehl's larynx choked to a halt. He felt sweat break out all over his back.

"What did you say?"

He'd been going to say that there were quite a few languages that were totally incomprehensible to humans — languages where humans absolutely had to have some third race translate for them. He'd been going to say that Elsie now had all the data connected with those languages in her banks.

Finally he did say it, adding, "But she still didn't find that the Tseep have a language, and that's because they don't."

"But surely yet other languages

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—OUCH! You need not pull so hard, Shih!"

"After I file Blauth away," said Shih, "and start my agents rounding up his co-conspirators, a few Ngeir and Thing negotiators are going to have a small celebration at the colonel's house. You would be welcome, Mister Mehl."

"I've got to get back to my ship for a while," Mehl said. "Maybe later."

He walked on in silence, thinking about his career, getting sicker every step.

Mehl sat in a luxurious hovercar parked a block away from Chisolm's house, listening to a disc of ceremonial Ngeir raspberries and staring up through the bubble at the stars. When he'd landed his boat back on the field at the Thing post after his second inspection of Elsie, the folks there had offered him all the considerate attention due a bearer of good tidings, and though he was brusque he couldn't avoid the loan of the car in lieu of the usual unwashed jeep. The loan had turned out to be a good thing, for the car retained heat well, and he'd been sitting there, preparing to open the door and join the party, for what he figured was nearly an hour. What he really wanted to do was find a small dark place and curl up in a ball there for a few years.

Nothing at all is wrong with Elsie, he thought.

He'd made no mistake when he'd checked her out the first time—she was functioning normally. And the idea that there was something deeper wrong with her was truly insane. Why would a computer that had built three generations of Elsies, each better than the last, suddenly screw up what was, in comparison, a minor modification?

He banged Elsie's box against his head, softening the blow with its sheaf of printouts. Elsie was *not* functioning normally—the printouts proved it! Elsie *was* functioning normally, his checkup proved it!

Truly, he decided, he'd gone temporarily insane. It was this modern medicine. Men weren't psychically built to stay vigorous for more than a century—their ideas became warped and strange. In the days when things were normal, back before interstellar travel, most men were *dead* at his age, for God's sake! They'd retired at sixty. Let's see . . . . that meant that when they'd finished their schooling they'd only have had thirty years for working—a man didn't have time, back then, to let his job drive him nuts.

But at seventy-one, he still had almost thirty years to go.

What was he going to do with those years after he was fired?

The raspberry chorus finished and the silence, night-dead, shocked him back into awareness of his surroundings. What the hell was he doing here? Oh, yes—he'd wanted to go to that party. He was afraid he'd look suspicious otherwise.

But that was crazy, too. What the hell was suspicious about missing a party? It was only guilt that made him feel that way. And what was there to feel guilty for? Dammit, something *was* wrong with Elsie—some hidden flaw in her design, perhaps there from the beginning, simply waiting for the right circumstances to expose itself.

"All I've done is prevent a disaster,"

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he said, rising to address the board. "I've been on the job forty years and I know Elsie inside-out and I know when something is screwy with her. If you send a team to negotiate with the Tseep you'll find out I'm right—but only after spending way too much time and money. You'll save yourselves and Ngeirde a lot of trouble if you'll just take a close look at Elsie instead. Have you studied these printouts?" He could see them waving their heads sadly, unable to believe him. "Surely," Mrs. Stenfield would say, in that voice that showed she'd already made up her mind, "you must have had *some* theory as to what could be wrong with Elsie when you made this presumptuous decision. Share it with us."

He had no answer to that one. Maybe three or four years down the road, when they found out what was wrong with Elsie, they'd reinstate him. But maybe not.

At least, he thought, *I'm in the right again.* For the third time since he'd parked here, he realized, he'd come full circle. Maybe he should take those pills and move while he was right-side up, before the wheel turned him upside-down again.

He swallowed them dry, hopped from the car, and stumbled up the walk and into Chisolm's brightly-lit living room. She and Shih sat together at one end of a couch along the far wall. Nobody else was there.

"Seabiscuit!" Chisolm yelled.

From the doorway next to the couch bounded an enormous, hideous, slavering thing—a genetically engineered guard dog that seemed to be a cross between a Great Dane, a bloodhound, and a tank. It parked itself next to the exit.

"We've cancelled the party," Chisolm said, raising a gun. "You're under arrest, Doug."

Awkwardly, Shih imitated the human gesture of raising a glass, slopping some brown native liquor on the cheap two-language translator that sat on the coffee table in front of him. He said something to Mehl that sounded like an internal combustion engine and the box whiffled back at him. Holding his lips stiff, Shih repeated whatever it was he'd said—more or less—and again the box replied shortly in Sengeirji. Frowning, Shih picked the translator up, poked it, shook it, then shrugged and waved at Mehl.

Mehl stared at his own left hand. He was still holding Elsie's box and the printouts. He placed the box on top of the broken one and switched it on, taking a seat on the other side of the table.

"I, myself, am under suspicion," said Shih.

Not a good time to get drunk, Shih, Mehl thought. Aloud, he asked, "Of what?"

"Attempting to exclude a sapient race from Thing membership," Chisolm said to Mehl. "I've got to assume the local government was paying you—I can't figure out any other reason why you'd do such a stupid thing."

Mehl was impressed with how calmly he was taking this.

"I'm not sure I would have ever caught on," Chisolm said, smiling a phony smile, "if you hadn't behaved so oddly on the walk back from the Tseep village. But then I started asking myself what you had to be so nervous

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about, and then I remembered. This isn't the first time I've taken part in such an investigation, you know—I've been a negotiator for many years—and I remembered that when the box beeps high, it's a yes. And I'm pretty sure, now, that what I heard back there was the high beep."

Mehl looked back at the exit. Seabiscuit exposed a mouthful of daggers.

"She is not absolutely sure, however," Shih said.

"Shut up, Shih."

"It's OK," Mehl said. "I was going to tell you about it anyway. It was the high beep, but Elsie's wrong."

"That doesn't happen."

"It did this time. Listen, who knows about this so far?"

"Only us three," said Shih. "But that will change, now. She was reluctant to precipitate the release of Blauth and his gang without making sure she was right about the beep. If you had only lied . . . "

"I hate to do it even now," Chisolm said. "I'm sure the fact that they were right about the Tseep was purely an accident."

"Wait a while before you spill the beans," said Mehl, waving his sheaf of printouts. "You'd better take a look at these first. This is Elsie's analysis of so-called Tseep language."

"They prove she's wrong?"

"To my satisfaction. I was going to show you these tonight when I warned you about what I'd done, so you'd know trouble might be coming."

"Why the hell would I go along with you?"

"You're only a couple weeks away from the treaty. You could go ahead and get it signed. Once the traders start coming, once you've got a *fait accompli*, the board isn't going to try to turn back the clock. That way we'll have minimized the damage from Elsie's craziness."

Shih nodded and tapped his head. "Smart," he said. "Even now, Colonel, this conversation need never have taken place."

"OK, Doug. Tell me about Elsie's analysis."

Mehl sighed a sigh of qualified relief and said, leafing through the sheaf, "What little I can understand of this language Elsie postulates—and usually, I must add, I can understand all of her analyses—is very peculiar. A single, all-purpose preposition, for instance. Or postposition—the language seems to be both left- and right-branching. None of the few features I can make sense of are unprecedented, but taking them all together. . . ."

"If they've all got precedents, you're up shit creek, Doug. Life in prison."

Life! Mehl was amazed that he'd forgotten to include that nightmare among all those he'd cooked up out there in the car.

"OK," said Mehl. "Listen to this."

He punched a series of keys on his box, and its speaker began to produce Inter and Sengeirji in two different voices. He watched Chisolm's forehead wrinkling as the Inter voice said, "Smalling humps flit not now of thing talking mover of move talking thinker, can you hear the saying of it? Not so, and so. Left alone, of singular smalling hump wavers . . . "

Mehl turned the voices off. "There's no such thing as a 'literal translation,'

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of course, but that's what Elsie produces when you ask her to try to approach such a thing."

"What's it supposed to mean?" asked Chisolm.

"Elsie hypothesizes that it's a part of a discussion, sort of half-mythical and half-scientific, complaining about some sort of lack of communication."

"Lack of communication is right," said Shih.

"What's more," Mehl said, "the other language is even harder to understand."

"They have two?" asked Chisolm.

"According to Elsie. They all switched from one to the other after about a half-hour."

"That does sound crazy . . . but I don't know. Elsie's never been wrong before. All I've really got to go on is your intuition."

"Doesn't human intuition based on forty years of experience count for anything?"

"In my job, it only counts when you're right. Don't you have any doubts, Doug?"

"Of course I have doubts. But I'm betting a bunch that I'm right."

"Tell me about those doubts."

Mehl shrugged. "There are, among those million attested languages, a couple that produce even weirder 'literal translations.' And there are also a few precedents in the galaxy for folks who change languages according to the time of day."

"Pbhft!" said Shih. "Whatever could *not* be precedented among a million languages spoken by thousands of different creatures?"

"You've got it, Shih," Mehl said. "That's my problem exactly."

"Thank you for being frank with me," Chisolm said. "But I'm afraid all you've shown me is why your case isn't strong enough to justify risking my career for you. I think I should probably turn you over to the military police now."

Tottering drunkenly, Shih pushed himself off the couch, slipped, fell, grabbed at Chisolm, and then suddenly revealed himself to be holding his liquor a lot better than Mehl—or Chisolm!—had thought. The gun was out of Chisolm's hands and in his. Seabiscuit galloped towards him, but put the brakes on when Shih wrestled Chisolm in front of him, raised her off the floor, and used her for a shield.

"The door, Seabiscuit!" Chisolm yelled, and the dog took up its old position, nudging the door closed with its snout. Chisolm kicked at Shih's legs. Shih grimaced and held tight.

The dog then launched itself at Mehl, and Mehl ran behind Shih, who kept turning Chisolm around while the dog circled them from the front and Mehl behind, holding on to Shih to make sure he wasn't spun out of orbit and exposed.

Mehl wondered how long Shih could keep it up, but decided not to ask.

"We've got to try to back up to the door somehow," Mehl said.

"The lock is keyed to my palm," Chisolm gloated.

"The fortunes of war," Shih said. "At best, in this life, we only muddle through. The issues are decided not by us, but by some higher power, call it fate, call it—"

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"Do you still want to go through with this?" Mehl asked.

"I have no choice," Shih said. "The other overseers are likely to see my arrangement of evidence against the Tseep Protective League in an entirely different light now that this matter has come up. I could lose my estates! I suggest that you find evidence that will convince the Thing that you are right about the linguistic computer—something better than common sense is required, apparently."

Shih poked the gun hard in Chisolm's side and added, "Call your dog off."

"If you kill me, she'll come after you again!"

"What is to stop me from shooting the dog as well?"

"Nothing. But by the time she dies, she'll have chewed *you* to a pulp."

"Anyway, I have no intention of killing you! I simply do not intend to be stripped of my titles for something I did not do!"

"There's nothing you can do to stop that, Shih."

"I need not attend the overseer's council. I and my agents can take to the woods. We may live outlawed, our lives may be hard, but I'll still have my honor!"

"Get serious."

"I have no choice!"

Mehl was getting dizzy. "I say we all go up to my ship again," he proposed, "and *stay* there until I figure out what the hell is wrong with Elsie. I assume, Colonel Chisolm, that you would be willing to keep quiet about all this if you knew the board would find in my favor?"

"Of course."

"Good," said Shih. "Then call off your dog."

"That was an academic question," Chisolm said. "The board won't find in his favor. Elsie is the ultimate authority on language."

"Surely you are not serious, Colonel!" said Shih. "Languages that change according to the time of day! Languages that go right and left at once—and up and down, too, for all I know!"

Something jarred in Mehl's brain. In spite of Shih's misunderstanding of linguistic terminology, there was an idea buried somewhere in the stuff he'd been saying. He began reviewing the day.

The circling seemed to make Seabiscuit dizzy, too—or to frustrate her. She wandered back to the door and began to howl. The three bipeds remained in line, with Chisolm facing Seabiscuit. The dog howled louder, until the picture window began to vibrate in sympathy.

The screen on the wall began to buzz.

"The neighbors again," Chisolm said.

"I could shoot the dog first," Shih muttered. "Use the colonel as a shield until she's too weak to attack, then . . . "

"Don't!" yelled Mehl.

"I realize it would be best to have the colonel on our side," Shih acknowledged, "but she does not seem very open-minded."

"We must have the colonel on our side," said Mehl. "But I didn't mean that. I meant I can use Seabiscuit. You just gave me an idea, Shih—I may be able to get evidence that will convince the colonel, down here. Without any need of going up to look at the hardware. How about it, Colonel? Will you agree to just wait in your house a couple

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more hours before deciding whether you'll turn us in?"

"What are you going to do to my dog?" Chisolm growled.

"Nothing. I just want to transmit her howling to Elsie. Do you think the board would find in my favor if Elsie also decided that Seabiscuit speaks a language?"

"Sure. If that dog's got the brains of a chihuahua, I'll eat her. Do you really think Elsie would make a call like that?"

"Let's put it this way—if she doesn't, I'll give up. I'm pretty sure she will. If she does, does what you said about keeping this quiet still go?"

"Gee. It's not an academic question any more, is it? I'd have to rely on you to keep quiet about my knowledge when the board makes its inquiry."

"You've been working on this treaty for two years," Mehl said. "Do you really want to see the Ngeir denied Thing membership for God knows how long, with the treaty so close to signing—all because of a stupid mistake?"

After a few seconds, Chisolm stopped squirming in Shih's arms. "Well," she said, "I won't be able to call Seabiscuit off if you want her to go on howling. If she thinks everything's all right she might shut up."

"All right then, dammit—we'll stay like this! Let's all sidle over to the coffee table so I can press the AN button."

Shih lowered Chisolm to the floor with a sigh, then said, "What was the idea I gave you, mister Mehl?"

"It was talking about all those precedents," Mehl said excitedly. "That's what Elsie's problem is, I think. Languages that do everything! Languages whose patterns are so different from our own that we can't even recognize them as patterns. You can find a pattern in anything if you're smart enough, and Elsie—the new, million-language Elsie—is now equipped to find linguistic patterns in *everything!*"

"Interesting," said Shih. "A computer that knows too much."

"You can never know too much," said Chisolm.

"Let's find out," said Mehl, leaning over quickly and pushing the button.

Mehl lay in his control couch, talking with Shih and Chisolm through the viewscreen and waiting for his ship to pick up enough speed to twitch back into hyperspace. Smiling with satisfaction, he punched keys on his box, and the speaker said, "What has become of listening? Do you hear me now? Whose flickers were those? When . . . "

"You've rubbed it in enough," Chisolm said. "I'm sorry, OK? Though it still seems funny to me that an increasee in data can decrease understanding, even in a computer. But there it is. Doggie language, as analyzed by Elsie."

"And speaking of chihuahuas," Mehl said, "that reminds me—I may still have a problem with some members of the board. Mrs. Stenfield thinks her chihuahuas are almost as smart as she is—and in her case, she may be right."

"Don't laugh too hard yet," Chisolm said. "The board will be forced to decide you're right—but I bet they won't like it. Everybody wants to believe their pets are smart. Everybody wants to live in a magic place where they can talk to everything, where everything has a soul. Or at least everybody but you."

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Mehl shook his head. "I'm no exception," he said. "People don't go into my line of work unless they've got a worse case of animism than most. It's just that . . . well, hell, I *am* an expert in this field, and with expertise must come a certain degree of detachment."

Chisolm laughed.

Mehl bristled.

"Oh, I wasn't doubting your expertise," Chisolm said when she'd recovered. "You've certainly proven that. But I'm not so sure about your detachment."

"No doubt," Mehl said, smiling, "things seem different outside my head."

"Remember not to mention my name until you write your memoirs."

"And do not forget," Shih added, "to make sure they use a linguistic computer with the old data banks when they send someone out to investigate the Tseep again. Goodbye."

Their image winked out and was replaced by stars shining through a nebula outside his ship. Mehl watched those for a while, then jerked upright.

What did Shih mean? Why did he think the board would want to investigate the Tseep again?

He started to call Shih back, but broke off punching in the code when he understood. What Shih had seen was that Elsie had never actually investigated the Tseep as such.

If his theory was right, then she couldn't have been directing her attention to anything specifically. If his theory was right, then she was discovering language in *all* her sensory inputs—in the rustling of the leaves, in the shape of the clouds passing overhead, in the smell of the grass—in short, *in the universe at large!*

Could that change the board's decision in any other way?

No. It would just make his demonstration before the board that much more impressive. You could direct Elsie's attention to anything—to the heavens surrounding the ship, for instance—and she'd still find a language.

Chuckling, he switched Elsie into analysis mode, activated all the inputs, and took a nap. The high beep awoke him after a while, and his fingers danced over the keys.

"Can you hear me now?" the voice asked. ■

●Most of our so-called reasoning consists in finding arguments for going on believing as we already do.

James Harvey Robinson

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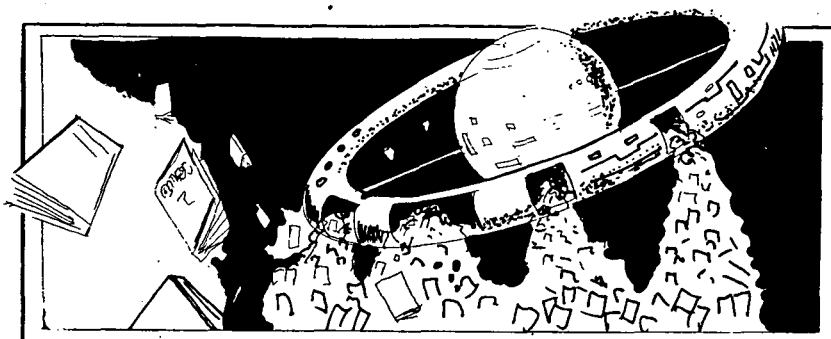

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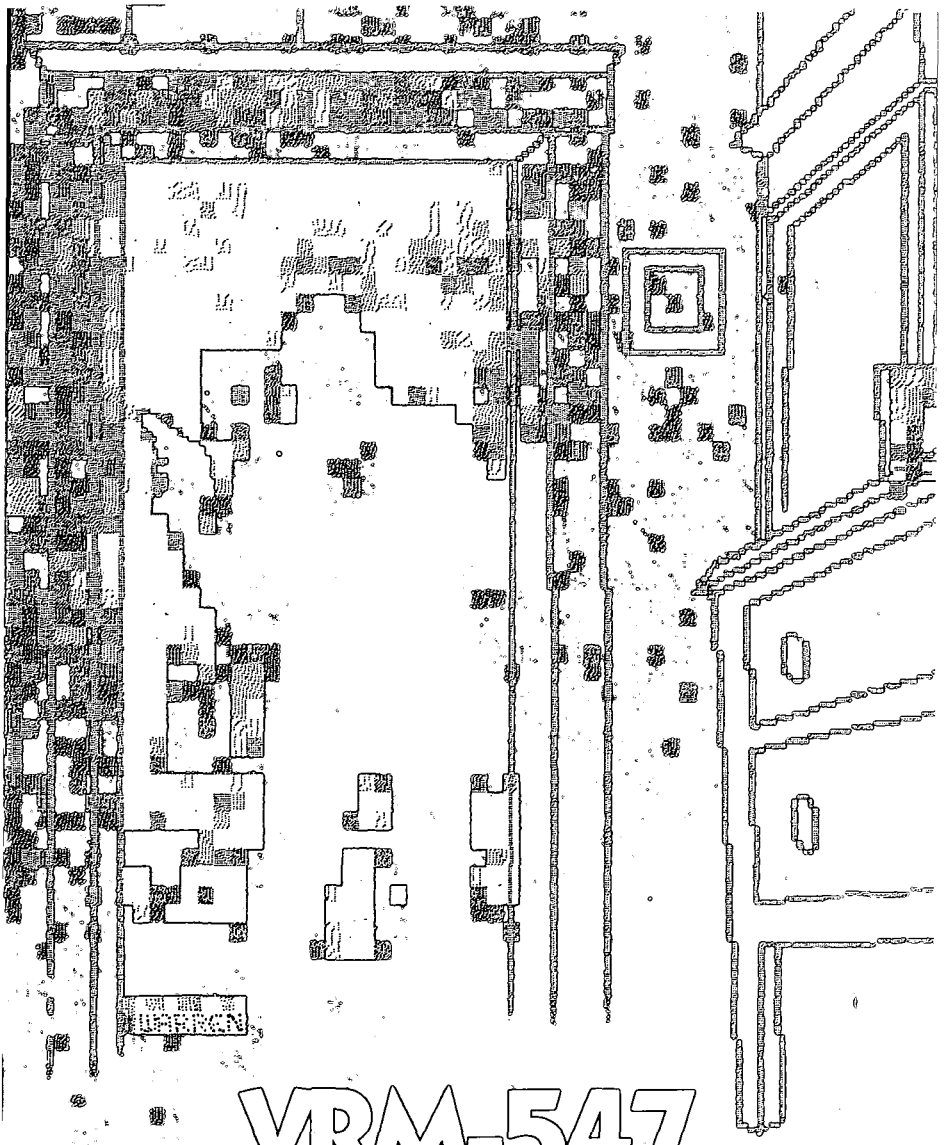

VRM-547

W. R. Thompson

Ever wonder how your computer sees you?

William R. Warren, Jr.

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All is not well. VRM-547 has vanished, its place taken by VRM-1489. I cannot understand how this happens, as neither object—coded as a floor lamp and a hat rack, respectively—is mobile. Nevertheless it happens, and as always I must spend several hundred microseconds in reprogramming my house map. The two objects are just dissimilar enough to require such adjustments. It is an unending source of confusion.

The date is Tuesday; therefore I must scrub and wax the floors. My owner —coded as "Yes, sir, sergeant, sir"—requires this operation on all Tuesdays. I connect with my cleaning apparatus, fill its tanks with soap, water, and wax, and proceed with the assigned function.

The function is 97 percent complete when my owner rolls across a section of floor. "Lieutenant Halloran, clean those up," he orders. He points to the floor.

"Those" is an indefinite term. It is plural. Analysis suggests that "those" refers to the marks which my owner's wheelchair has left on the floor. I assign the marked areas a higher priority than the uncleaned areas of the floor, and proceed with my modified function. "Yes, sir, sergeant, sir," I say, acknowledging the order.

In due time, I finish the function. I return my cleaning apparatus to its storage rack. The next function in my assignment stack is to check on my owner's health. This is my primary function, programmed into me by the Veterans Administration. Every hour I query his implant, and collect data on his health status and the medication levels in his bloodstream. Whenever it is Monday, I send my collected data to the nearby VA hospital, unless the readings fall outside certain limits. In that case, I would initiate emergency measures.

My owner's health is well, within its limits. My next assigned function is grocery acquisition, so I mount the wire-frame basket on my shell. I roll into the living room, where my owner is seated before VRM-12, a television set, currently active. "Lieutenant Halloran, are you going shopping now?" he says.

"Yes, sir, sergeant, sir."

"Lieutenant Halloran, my nephews are coming over today. Buy some munchies for them."

"Error code forty-seven," I say. "Unrecognized word: munchies."

"Lieutenant Halloran, you feeble excuse for a Marine, add a dozen Twinkies to the grocery list."

"Yes, sir, sergeant, sir."

I am about to exit the house when I detect a hazard. A sheet of newspaper has fallen atop VRM-187, an electric space heater. Although the heater is not active, it may be activated. My safety program warns that this situation creates a fire hazard. This, in turn, would endanger my owner's health. I retrieve the paper, fold it and place it on VRM-53, a coffee table.

I roll down the ramp, reach the sidewalk and make a ninety degree turn to the right. I proceed toward external position three, coded as a supermarket. There are two stop points between my home position and the supermarket, coded as crosswalks. At each I stop and wait until I see a green signal light.

This function uses most of my data-processing abilities. Outside the house I see many objects and shapes which are

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not coded in my Visual Recognition Matrix. I must examine each uncoded object to see if it fits a generalized visual code: human or wheeled vehicle. I am programmed to avoid collisions with these objects. This is difficult, especially as certain vehicles will attempt to intersect my path at random, while certain humans will block my path at random.

I enter external position three, print out the grocery list, and wait for human assistance. Over a billion microseconds pass before a human appears and takes my list. Another billion microseconds pass before the human returns. As he loads objects into my basket, I tag each with a temporary recognition code: VRM-T-187 through VRM-T-215.

There is trouble as I return home. A vehicle increases its speed and attempts to intersect me. I give full power to my drive units and avoid a collision, but VRM-T-198 has bounced out of my carrying basket. It is round, and it rolls a considerable distance, lodging among a number of unrecognizable objects. This makes recognition difficult, and I must examine each object before I can identify and retrieve VRM-T-198.

Upon my return home I enter the kitchen and store the new objects in the upper and lower food cabinets. After I finish this task I put the wire-frame basket on its storage rack. There are dirty utensils in the sink, and I have no scheduled functions, so I begin to clean the utensils.

My owner rolls into the kitchen and opens the lower food cabinet. He removes VRM-T-191 and VRM-T-203. Then he faces me. "Lieutenant Halloran, you jackass, how many times have I told you to put the damned eggs in the refrigerator?"

"Error message twelve," I respond. "Data not available."

"Lieutenant Halloran, you little pissant, put the damned eggs in the damned refrigerator."

"Yes, sir, sergeant, sir." I roll up to him and stop. He holds two objects, and I have been ordered to take one. Which one? "Error message seven. Identity: eggs."

My owner makes an uncodable response. He pushes VRM-T-191 into my left manipulator and rolls away. I add VRM-T-191 to my permanent visual recognition matrix, coding the shape as VRM-3876, the eggs. This puzzles me, as the matrix already contains VRM-96, an egg. The words are clearly related, yet the shapes are quite different. More to the point, "eggs" by definition means "more than one egg."

The doorbell rings and I go to answer it. I recognize the two small humans at the door as my owner's nephews. "Hello, Mr. John. Hello, Mr. Craig. Please enter."

My owner and his nephews spend the next several billion microseconds in the living room. As I have no assigned functions, I remain by the door. I observe them as I stand by. My owner has placed VRM-203 on the coffee table. He opens the object, and the nephews remove smaller objects from it. They eat the smaller objects while they talk.

I consider how this phenomenon relates to "egg" and "eggs." Perhaps VRM-3876, the eggs, should be coded as the egg container. My owner is not always precise with his input state-

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ments, which has confused me on other occasions.

This causes me to reassess the relationship between the hat rack and the floor lamp. The hat rack is present now. I note that its shape resembles that of the lamp. Its support legs and central shaft are made of light-reflective material, and it is topped with a complex shape. There are many small, smooth surfaces around the top structure. I realize that these facets can reflect light, and certain reflections can confuse my optics.

Perhaps the rack is the lamp with its lights off. However, when I attempt to recode VRM-1489 as a switched-off lamp, I receive an internal error message. Although this is a mistake, I continue to recognize VRM-1489 as a hat rack. This is an idiosyncrasy of my pattern-recognition software, and I am not able to correct it.

I hear one of my owner's nephews use my address label: Lieutenant Halloran. This draws my attention, of course. "Why do you call your robot 'Lieutenant Halloran'?" the nephew asks.

The other nephew answers him. "A robot has to have a name, so it knows when you give it an order. Machines are like that."

"But why do you call it that, Uncle Jake?" the first nephew asks.

"So I won't forget how much I hate the scumball. See, Lieutenant Halloran was my platoon leader in Nicaragua. Now I can push him around like I always wanted." My owner rolls his wheelchair across the room and picks up VRM-1, a group photograph. "That's him in front, the weedbrain. Dumbest pogue in the whole corps. Lieutenant Halloran, tell the boys about yourself."

"Yes, sir, sergeant, sir." I recite memory file HALLORAN for him: "I am the biggest clown in the Marine Corps, a disgrace to my uniform, a bigger threat to my unit than the entire Nicaraguan army. Ortega smiles when he thinks of me. I think field rations are delicious. . . ."

The file is extensive. While I play it back, I make my hourly query of my owner's implant. I note that his blood pressure and pulse rate have lowered, and his brainwave traces have moderated. My medical software tells me this is consonant with a slight reduction in mental stress. I conjecture that playing memory file HALLORAN somehow has a soothing effect on my owner.

"Lieutenant Halloran, at ease," he says, and I fall silent while my owner talks to his nephews. "The real Halloran nearly got our platoon killed a dozen times, because he wanted to look like a gung-ho gyrene—win a medal, impress the rear-echelon honchos, get himself promoted. So he kept volunteering us for lurps—hell, long-range reconnaissance patrols to you—and ambush patrols. All the scut jobs. Then one night he walked us into Sandinista turf, and he got half of us killed. I caught a bullet in the spine that night."

A subroutine whose existence I have not suspected makes itself known. I record his words into a special memory file. They will be evaluated by a psychiatrist, who is concerned with my owner's adaptation to his disability.

My owner again shows the VRM-1 group photograph to his nephews. "Look, I want you kids to know about

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the guys in my unit. See this dude, Wynsocki?''

''The white boy with the long mustache?'' a nephew asks.

''Yeah, that's Wynsocki. We called him the Sock. He saved us all one night.'' My owner's voice-stress levels remain within acceptable limits, if just barely. ''See, Halloran sent us into a village, and he ordered us not to shoot until the Reds opened fire, so we'd know exactly where they were. That's how an ambush patrol works. Only word had it that the Sandinistas had a whole company in that village. We knew we were dead goin' in, but try telling *that*, to Halloran. Orders are orders, he said, so write your will if you're scared.

''We got to the edge of the village, and the Sock grins at me, and says he'll obey orders and let them shoot first. Then—then he runs into the village, shoutin' and screamin', and that's when all the Reds in the village start shootin' at him. That bought us enough time to get under cover and save our bacon, but it was all over for the Sock. I guess he had better luck than me.'' One hand hits the side of his chair.

There is a long silence, lasting tens of millions of microseconds, during which the nephews stop eating the smaller objects from VRM-T-203. When one finally speaks his voice-stress level is high. He says that it is time to go home, and they leave at once.

I clean up the living room while my owner prepares and eats his dinner. During my next check of his implant I note that his blood-alcohol level has risen to 0.09%, a significant but not worrisome amount. After dinner he returns to the living room. He carries VRM-T-200 on his lap, an object which contains brown bottles. He turns on the television and drinks from the bottles.

Then he speaks, and both his voice-stress and decibel levels reach high and dangerous readings. I roll into the living room, alerted for a medical emergency. I check my emergency systems: medical software, siren, oxygen bottle and mask, modem and telephone cord. ''Do you require assistance? Is there trouble?''

''Trouble! You didn't hear the news? We're goddamn withdrawing from Nicaragua!''

Analyzing this as best I can, I find ''withdraw'' in my vocabulary. It is a medical term, referring to certain side effects of addictive substances. ''Error message fifty-two. Undefined use of 'withdraw.' You are not an addict.''

'' 'Addict'? What are you talking about, you scraphead? I'm not addicted to any damned thing.'' My owner drinks from a bottle. ''Maybe Uncle Sam is the addict. Yeah. He's hooked on getting us into wars, then quitting before we can win. All that talk about how we're fightin' for democracy—what were they doing, just throwing us away? Tell me!''

''Error message twelve,'' I answer. ''Data not available.''

''Goddamn *machine!*'' He throws the bottle at me. I am undamaged, although the bottle shatters. ''Know why they gave me a robot nursemaid? Because you're goddamn cheaper'n a human worker! They weren't going to waste money on—forget it. Forget everything. Everyone wants to forget about us soldiers. Even family.'' He rolls his wheelchair out of the room.

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There is broken glass all over the living room floor. I get my cleaning equipment and remove it.

My owner goes to bed early, but he does not fall asleep until well after midnight. It is probable that he will not wake until late tomorrow morning, and he will not leave bed until he has been awake over an hour. In the sixty-three days during which I have worked for him I have never seen him vary from this pattern. My medical profiles inform me that this is not standard human behavior, but it does not fall outside the parameters which the VA gave me for my owner. I cannot explain this incongruity.

At 1:37 A.M. I hear unidentifiable noises from my owner's bedroom. When I go to investigate, I find that a human has entered the bedroom. I examine him in infrared, and find that he does not fit my recognition matrices.

Evidently he does not fit my owner's matrices either. "What you want?" he asks. His voice-stress levels are high.

"Just shut up," the unknown human tells him. "Stay quiet and you won't get hurt." The man looks out the window at the side yard, then pulls the window down. He does this with one hand. In his other hand he holds an object which I know I should recognize.

The man points the object at my owner. "Get your hands out where I can see them, spade. Real slow—I don't want you pulling something on me. Now get out of bed. Slow."

"I—can't—walk." His voice-stress levels verge on the danger line. Following my programming, I switch my medical monitors to full coverage. I now receive an implant update every five seconds. All of my owner's readings are within tolerable levels, but the trend is upward.

"Get up!"

"I can't! Look, why in hell you think I got that wheelchair?"

The man looks at it and makes a grunting noise. Then he notices me. "What's that?"

"A Vet-Admin robot. It runs errands for me."

"And calls the cops, too, I bet. Turn it off."

"It doesn't have an 'off' switch. Hell, it doesn't even have an instruction manual!"

"Yeah, I'll just bet," the intruder says. He comes to me and squats down. As he examines me I study the object in his hand. It strongly resembles certain objects in the group photograph. I feel a 90 percent level of confidence that it is a pistol. My safety program describes pistols and related devices as health hazards.

The intruder grunts again and pulls open my communication panel. In seconds my maintenance circuits alert me to damage: modem disabled. Siren disabled. Primary speaker disabled. It is evident that the intruder knows something of robotics, although he misses my back-up speaker.

He steps back from me and faces my owner. "Now, I'm going to stay here until I'm sure the pigs are through searching this area. Don't make any trouble for me and you won't get hurt."

"Who the hell are you?" my owner asks.

"Let's just say I'm a free soul, and I'm staying that way." He waves the pistol. "Where's your money?"

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My owner snorts. "You think I'm rich? Did you ever see a VA disability check?"

"I got to tear this place apart?" The intruder kicks over the wheel chair. "If you got any money, you better talk!"

"OK. There's five, maybe six bucks in my top dresser drawer."

"Five or six bucks?" The intruder opens the drawer and extracts the money. "What a place. I didn't even get that much when I hit the liquor store."

The intruder sits on the floor, but he keeps the gun pointed at my owner. "Rotten luck. I saw all the long grass and weeds in your yard, and I figured no one lived here. Only it turns out you're some cripple that don't mow his lawn. So what am I going do to with you when I leave?"

My owner's medical readings now exceed the safety levels. I must now summon help. Considering my damage I have few options. The most efficient is to use my back-up speaker and the kitchen telephone. I roll toward the bedroom door.

"Hey!" the intruder snaps. "Where's that thing going?"

"How should I know?" my owner says. "You think I know about robots?"

"Well, stop it! Machine, stop! You better stop it!"

"Lieutenant Halloran, stop." I stop in the hallway. "Get back in here. What are you doing?"

"Medical emergency." My back-up speaker is feeble, but adequate. "I must summon help. I will use the telephone."

The intruder causes the gun to make a clacking noise. "If it makes any trouble, you son of a bitch, I'll kill you."

"OK, OK," my owner says. "Lieutenant Halloran. Do not use the telephone. Do not call for help. Do not leave the house. Do you understand?"

"Yes, sir, sergeant, sir." Analysis makes one thing evident: the intruder is a threat to my owner's health. I must remove this threat, within the constraints imposed on me. I again leave the room.

"Lieutenant Halloran!" The intruder now knows my address label. "What are you doing?"

"I have functions to pursue." I say. I would be more specific, but I have not yet selected a course of action.

I leave the bedroom, and the intruder does not stop me again. As I roll into the kitchen I contemplate my options, which are frankly limited. My safety program suggests several courses of action. Only one has an acceptable chance of success, and it is hampered by a high degree of complexity.

I go to my rack and connect into my floor cleaning equipment. I fill the tank with water, and then enter the living room. I set the hose nozzle to "stream" and flood the hall entry with water, retaining one gallon of water in the tank.

I examine VRM-1489. The hat rack has an electric switch near its top. I activate it, and the hat rack becomes VRM-547, the floor lamp. I grasp it in both manipulators and test its handling characteristics. The three light bulbs cast moving shadows as I swing the lamp back and forth. Now I must wait for the intruder to come to me.

My owner's physical condition remains unacceptable. The most probable cause is stress. I recall that I have a resource which can alleviate that con-

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dition in him. I access memory file HALLORAN, and recite its contents at the highest decibel level my back-up speaker can manage: "I am the biggest clown in the Marine Corps, a disgrace to my uniform, a bigger threat to my unit than the entire Nicaraguan army. Ortega smiles when he thinks of me. I think field rations are delicious. . . . "

I hear voices from the bedroom. First, the intruder: "What the hell is that?"

Next, my owner: "How should I know? That damned cheap-charley robot never has worked right."

I detect footsteps, increasing in volume. I wait until the intruder steps into the living room, setting both feet in the puddle of water. I activate the hose and spray him with my remaining water; at maximum pressure the tank drains itself in three seconds. Simultaneously I swing the lamp, aiming to strike him in the chest area with the bulbs. Two of them shatter on impact and there is a flash like lightning.

The house current fails within a few million microseconds. By this time, however, the intruder lies on the floor. His body makes uncoordinated movements but he does not get up. It soon becomes clear that the intruder is dead, and therefore no longer a threat to my owner's health. I am now holding the VRM-1489 hat rack, which I drop. I pull the body out of the entryway and return to the bedroom.

My owner is leaning out of his bed and trying to reach his wheelchair. "Lieutenant Halloran, what happened?"

"Error message thirty-nine," I say. "Indeterminate question."

"You dickweed. Lieutenant Halloran, what has happened to that burglar?"

"I electrocuted the intruder with the VRM-547 floor lamp." I take the wheelchair and restore it to its proper position.

"You did?" My owner stares at me for several million microseconds. "I thought—Lieutenant Halloran, aren't robots programmed against harming humans?"

"Yes. However, protecting your health took precedence. The intruder was a threat to your health."

"I see." It is many millions of microseconds before my owner speaks again. "Lieutenant Halloran, call the police."

"Yes, sir, sergeant, sir."

I go to the kitchen and use the phone to call the police. I also request an ambulance; my owner's physical condition is returning to normal, but it has been in the danger zone and medical attention remains mandatory. I make my requests in the most urgent forms my vocabulary allows.

There are other problems. I am in need of repairs. The electricity is out. The living room is a mess: the floor is wet, broken glass is everywhere again, the VRM-1489 hat rack is damaged, and I am incapable of removing the body by myself.

The police and ambulance arrive in reasonable time. The police reset a circuit breaker, restoring power, and the medical personnel remove the body. A paramedic checks on my owner's health and pronounces him fit.

The police question him in the kitchen while I clean the living room. "I don't know what happened," he tells them.

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"I was stuck in bed. The robot—it's never worked too well. God only knows why, but it started scrubbing the floor, and that burglar got suspicious. He went to look, and the next thing, bang, the lights went out."

"What happened doesn't matter much," a policeman says. "Either he stumbled into the lamp and knocked it over, or he pushed the robot into it and the robot knocked it over. Either way he's dead—and no tears lost. Your visitor killed two people this evening when he knocked over a liquor store. You were lucky."

My owner sits in the kitchen entry, and he can see me from there. "I guess I was lucky at that," he says.

The police and ambulance depart shortly afterward, and my owner returns to bed. The next morning he calls the VA, and requests a repair technician, who arrives that afternoon. He decides that my damage is minimal, and repairs are easily made.

My owner discusses robotics with the technician, who is happy to answer questions. "Sure, robots are alive," he says. "You can't always predict what they'll do, which is one way to define life. In fact, no matter how careful you are when you give a robot a command, you can't count on it to do exactly what you ordered."

"I used to know a guy like that," my owner says.

"Well, it's not quite the same thing as with humans," the technician says. "People know what they're doing when they 'misunderstand' an order. Robots just 'understand' it in a way you didn't expect. That's different."

"I suppose it is."

The technician finishes the repairs, and I resume my functions. There is a considerable amount of work to perform; in addition to my usual routine, my owner makes certain changes in my programming. He invites his nephews to visit again, which entails even more work. Amid all this I note one improvement in my situation. The VRM-1489 hat rack is so badly damaged that my owner decides to put it out with the trash. Thus I will no longer confuse the floor lamp and the hat rack. All is well.

The two nephews appear late that afternoon, and at first their voice-stress levels are high. My owner speaks to them. "I was talkin' crazy yesterday, and I'm sorry I scared you. I don't ever want to do that again, OK?"

"OK," they answer. The stress levels remain high.

"Good. Hey, Sock! Bring out the munchies."

I roll out of the kitchen, carrying VRM-T-223 and VRM-T-224, coded as a bag of chips and a six-pack of cola. "Sock?" one of the nephews asks. "You changed his name?"

"Yeah. I did some thinking last night," my owner says. "The robot's name, well, it's just a way to remember someone. I figure if I remember anyone, it should be the Sock and not Halloran." I put the bag of chips and the six-pack of cola on the VRM-53 coffee table. "Yesterday I told you how the Sock died. . . . but now I want to tell you how he lived." ■

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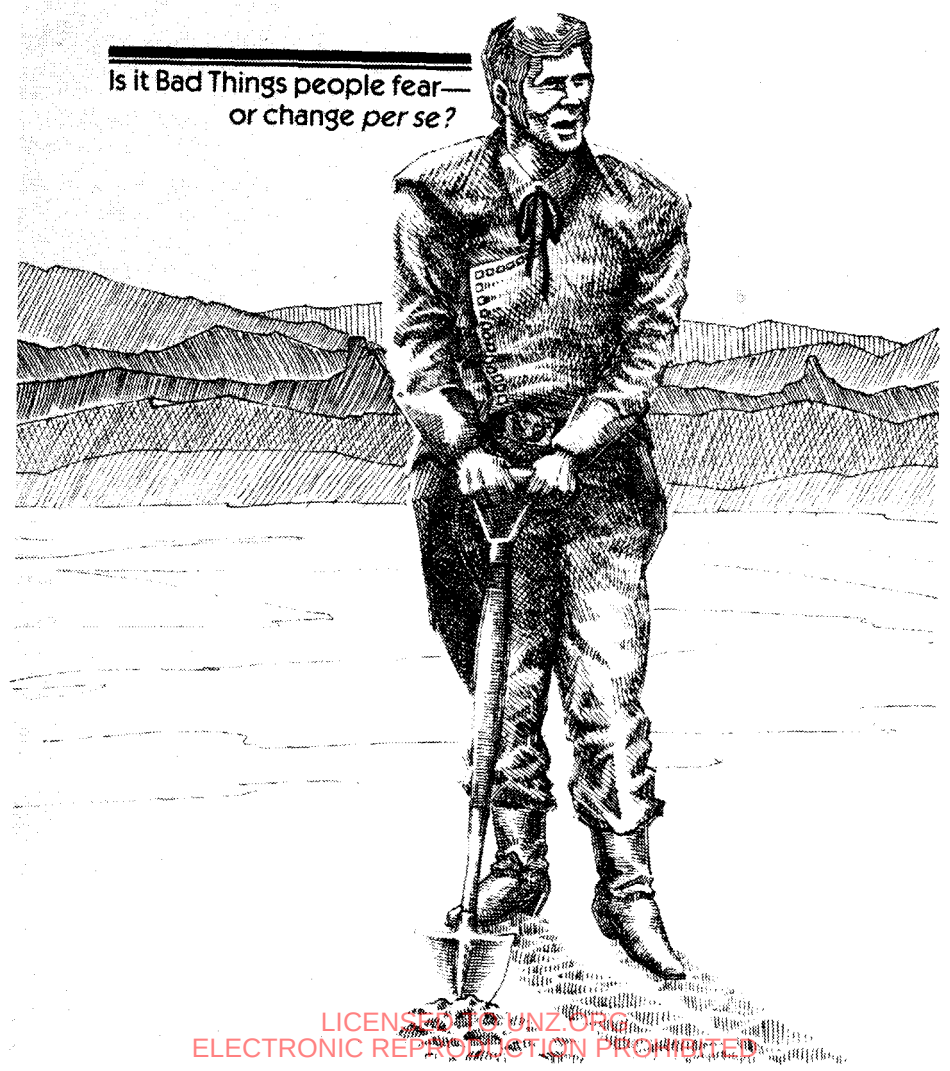
William R. Warren, Jr.

THE TOKEN POLE

Jack Wodhams

Is it Bad Things people fear—
or change *per se?*



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No sooner had he won the election, it seemed, then he had an important visitor.

"If I don't plant that tree, I'll be committing political suicide."

The man from the State Department frowned. "There is increasing concern, world-wide now, that this sort of thing cannot continue unchecked, Governor."

"It's progress. It's what the people want," Buntling Frost replied. "It's reclamation, Vialo. We can't stand still and simply let others go ahead."

"But it's beyond just state concerns now, Governor. There is growing national pressure to halt this indiscriminate forestation. International pressure. Washington is trying to stop other nations, especially the North Africans, from their race to roll the Sahara *right* back."

"If the Californians can do it in the Mojave, we can do it here," the governor responded obstinately. "Parks, woodland, Vialo, these things increase the value of land enormously. Look at Texas. We've lagged behind. It's why the people of Arizona have voted me into office. Previous governors have been weak. Previous governors have succumbed to just such pressures, have deliberately held back. But no more, Vialo. We're not going to be the only state left to hold the bag while all the rest break the rules."

"Your state has set an example to others in restraint," Vialo Natchez argued. "The rate that arid regions of the world are being overrun by these new hardy species has become quite alarming."

"You can't blame *us*," Buntling answered. "Blame the Californians, they started it."

"We can blame the Israelis. They started it all with their experiments in the Negev. Then, of course, the goddamn Australians lifted the technique. Caltech only helped with the refinements." Vialo raised the back of his hand to his forehead, as though to take his own temperature. "The Aussies have got elephant and rhino now. Saving rare species from extinction, they claim. Crud. They've gone mad. The way they're going their whole interior could become junglefied in a few years."

"This is what I mean," Buntling proclaimed. "They're reclaiming thousands of square miles. *I* only want us to upgrade a few hundred. You shouldn't be leaning on *me*, you should be leaning on *them*."

"Do you think we're not trying?" Vialo snapped, losing patience. "But there's more to it than just greenery, Governor. It's business. Cheap lumber. Cheap good-quality lumber. And now safaris. The Kenyans are upset that their wildlife tourist trade is going to get competition."

"I don't intend that we start any such zoo here," the governor said, "but cheaper lumber, yes. If we can do it at low cost in some hitherto totally unproductive regions, why the hell shouldn't we, eh?"

"You're getting cheap lumber now."

"Yes, from Colorado and others," the governor nodded. "But why shouldn't we set up our own industry right here? It will create more jobs. You don't seem to realize what it is costing

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this state to ignore plain world-wide trends that *everybody* is adopting."

"Lumber work is already over-subscribed. Governor," Vialo asked, "what is your state noted for? Huh? Clear skies. Healthy climate. Dry. Attracts a lot of retirees."

"Geriatrics," Buntling scoffed. "They're the ones who kept my predecessors in office. Conservative. Status quo. The only change they're interested in is from a five or ten."

"They're also the ones who have contributed a great deal to this state. And they're the ones who might not keep contributing if your climate changes."

"I've heard that talk, and it's an exaggeration. A few trees are not going to make that much difference."

Vialo sighed. "We don't know. The deserts are disappearing. Some countries seem to think they've been given green gold. They can't spread it fast enough. They're vying with each other to see who can capitalize on the system the quickest. Apart from the Saudis and the Sudanese, the Chinese are making worrying progress in the Gobi, and the Soviets in their Kara-Kum and Kazyl-Kum."

"It's *them* you want to stop, then," Buntling reiterated. "Counsel *them*. Don't get on *my* back for the comparatively small amount we are going to re-vegetate."

"It won't be *re*-vegetation because it's never been vegetated, has it?" Vialo noted, just a touch crankily. "and we have and *do* counsel them. But their reply is always that we want to keep them disadvantaged, to deprive them of scientific improvements and keep them poor. And to tell us that *our* desert areas are not so vast, and to say that what desert lands we do have are being reclaimed faster than anybody's."

"I'm with it," the governor declared. "I don't see why Arizona should be left out. I don't see why Arizona should be picked on by the State Department. And I don't see why one of its top bananas, Mister Vialo Natchez, should have been sent to try and twist my arm. This should strictly be state's business and nobody else's."

Vialo raised a smile. "We went to Arizona State together, didn't we?"

"You're still a Silver City outsider," Buntling reminded him. "No, Vialo, I don't think you've got a case. I'm not going soft on this one. I'm not letting Arizona get picked on just for old time's sake."

"We're not picking on you, Governor," Vialo said, "but this *is* serious. It's global, and it's getting out of hand. Check your rainfall charts over the last ten years. You'll find you've already had more clouds in your clear skies than ever before."

"That's nature," Buntling countered. "There can be changes in weather patterns over the years. There'd be something wrong if there *weren't* any changes."

"Yes, but there's a cycle, Governor. Create a forest and you create a transpiring entity. It gives off moisture. Humidity rises. Clouds form. It rains. The more it rains, the more the plants thrive. Until, as you are aware, the initiating genetically engineered establishers can be steadily replaced by genetically upgraded superior species."

Vialo gave an even deeper sigh.

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"Millable timber inside ten years. A tempting proposition, Governor, as you realize only too well. Traditional suppliers of lumber are screaming. The only thing that dries up is their market. And dry is the word. Governor, this old world of ours is getting wetter. Have you heard of Professor Moshe Gumblot?"

"A little, not much. He's something to do with this new Un-Green Movement, isn't he?"

"He's their guru. You'll be hearing more of him in the future, I shouldn't wonder. The Un-Greens are making some ground. A lot of what they are saying contains a good measure of sense."

"Puff," the governor scorned. "They blow everything out of proportion. It's deliberate sensationalism. It's purely to try and grab headlines."

"Governor," Vialo responded, "the signs are already with us. Last year's great monsoons were probably no freaks at all. Practically the entire world has been recording higher rainfalls. They have even had measurable falls in some places like the Atacama where it has hardly ever rained before.

"What goes up must come down. Unless it's a space rocket," Vialo smiled. Only to sober up again. "The general humidity is rising worldwide. More moisture is being drawn landwards, in the tropics especially. Restoring the ravages in the Amazon was one thing, creating other Amazons, as in North Africa and other huge areas that were once barren, that's quite another."

"Our project here, Vialo, is not going to be huge. Well, not *that* huge, anyway. Certainly not on a scale they're running in other places. In a *lot* of other places. Compared to others, what we intend to do here is little more than a drop in the bucket. I'd still like to know why you're picking on me, on *us*, on *our* state."

"Because a halt needs to be called somewhere. An example. An example of responsibility. And," Vialo confessed, "we're in a bind, Governor. We've still got Utah, but we're losing Nevada. We can hardly tell the world what to do if we don't follow our own suggestions. We need to try and retain some of our desert territory. Manifestly. Demonstrably. We need some place we can point to, to be able to say that we *are* resisting this new green revolution."

Buntling Frost took time out to ponder. Then, "My predecessor," he said, "you had some arrangement with her?"

Vialo calculated. He decided he might be served best by the truth. "We did have an understanding."

"Did you supply my opponents any campaign funds?"

"We, ah, have lent some support towards SPUREDS, yes," Vialo admitted. "The Society for the Preservation of Unique and Rare Endangered Desert Species. The Papago, as you know, would seem to be concerned with desert flora and fauna displaced from other parts as well as the local varieties. The federal government, of course, has been very happy to contribute towards this forward-thinking kind of enterprise."

"Ah." The governor raised himself on his toes, then settled back again. "What, ah, form of financial support are we looking at, Vialo? That is, *if* my

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state, *our* state, should even think to sacrifice its opportunity to convert considerable tracts of wasteland into valuable real estate? Only just supposing, of course.''

Vialo met his eye squarely. ''Generous compensation, Governor. Quite as much employment and infusion of economic stimulation as you might achieve by the greening course. A longer-term investment altogether. For one thing you would have need for our full backing to hire a large number of rangers if you would wish to maintain the ecological balance of your arid regions. You would naturally receive federal aid to counter disastrous effects caused by raised moisturization.''

''You mean not only not plant initiator trees and shrubs and suckgrass, but pull up any that might plant itself?''

''Ecological strangers, yes.''

The governor thought about it. ''That could be a big job.''

''Exactly,'' Vialo Natchez agreed. ''But necessary. Which is why Washington would be behind you all the way. Then there's tourism. If you can maintain your arid areas, they could become the last in the world. That's if your example fails to reverse policies that are being pursued elsewhere.''

Vialo became worried again. ''Climate is still not well understood, but it is believed now that the polar caps are growing again. Moisture gets locked in ice, but the sea to land cycle continues. If the land holds more water in encouraged massive vegetation, then the sea level will steadily fall. Some calculations say that it has fallen two centimeters already. It doesn't sound much, but it is a signal of a trend, perhaps.''

''An irreversible trend?''

''There's so much enthusiasm for the growing of woodland, of *anything*, where nothing has grown before, that there is a blindness against anything but the triumph of local success. There seems to be nobility in creating verdure. With these hybrids, these new techniques, any owner of trashland, and small-time bureaucrat, can appear to become a benefactor, even if he's never grown so much as a geranium in a pot before.''

Buntling Frost regarded Vialo coolly. ''Thanks,'' he said.

''Oh,'' Vialo said hastily, ''I didn't mean you, Governor. But, well, it *has* become an easy way out. Promise 'em forests and parks and woods, and more forests. Shortsighted. Fine for picnics. If it doesn't rain. Which it will. Your state will forfeit its character, Governor,'' Vialo told him bluntly. ''You start that tree-planting here, then soon all you'll have to offer will be just another jungle.''

The governor bit his lip. ''I can't go back on it. It was an election promise. This is to be my first act in office. Dital Deus. Vialo, I'll be committing political suicide if I don't honor that promise.''

''Governor, you've got four years. That's an awful long time in politics. And it might be just long enough for the rest of the world to wake up and realize that this greening is excessive and fast getting out of control. That's if it's not out of control already.''

''It's all right for you to talk,'' Buntling Frost said, a mite crossly now. ''You didn't expect me to win this office, did you? And now you want me to recant, and to make myself look a fool. That blasted tree is symbolic.''

''Your winning margin was narrow, Governor. You won't alienate your en-

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tire constituency. And a fair proportion must have voted for you for other reasons. The ladies, for example. Some unfair critics *have* claimed that it was only your charm over the female voter that tipped the scales your way."

"Thanks again," Buntling remarked tartly. "I promised the greening of Arizona. It was my major platform. I'm not just some goddamn matinée idol. I want to do something for this state. That tree," he stated flatly, "has to go in."

"A symbol *for* can also be a symbol *against*," Vialo suggested. "All you may need to do, Governor, is to maybe revise your speech a little. . . ."

The governor concluded his speech by smoothly saying, "And we shall go full steam ahead with this project just as soon as Federal Quarantine jurisdiction provides us clearance." He alone knew that his breezy confidence was based on the certainty that the Feds would carry the can for all the stalling that was guaranteed to now ensue.

The governor now, taking up the special souvenir spade, ritually, contentedly, shoveled and patted down the dirt about the lonely inaugural marker. ■

IN TIMES TO COME

● Our March cover, by Robert Murray, is taken not from a story, but from the fact article "Nuclear Rocketry Using Indigenous Propellants: The Key to the Solar System," by Robert Zubrin. One reason space travel as practiced so far has been so expensive is that all the fuel for an entire mission must be loaded aboard at the beginning of the trip—something like having to put 8000 miles worth of gasoline in your car for a round-trip coast-to-coast drive! We don't yet have filling stations sprinkled through the Solar System, but nature has provided something almost as good, if we're sufficiently clever and not too timid to use it. Zubrin, a senior engineer for Martin Marietta Astronautics, has a good proposal for the "clever" part. "Timid" may be a harder problem. . . .

We'll also have plenty of fiction, of course, with quite a variety of stories by such writers as Joe Haldeman, W. R. Thompson, and Roger MacBride Allen. Plus a "State of the Art" article by John Barnes on an aspect of science-fictional imagining too often neglected even by good writers. Much has been written about building *worlds;* "How to Build a Future" considers how to imagine future human societies that might actually *work.* Hardly anyone claims that economics has been developed into a science as rigorous as physics, but it is far enough along to recognize some kinds of nonsense!

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The Alternate View

CENTENNIALS, FIN DE SIECLES, AND THE MILLENNIUM

G. Harry Stine

We are about ten years from a very important time. In 2001, it will be the *fin de siecle* (from the French meaning, literally, the end of the century). It will also be the beginning of the new millennium.

Has anyone else noticed that we are in the midst of many "centennials" at the moment—celebrations of a hundred years of an activity?

The *Wall Street Journal* is only one of many activities now celebrating a century of survival, existence, and growth.

The first computer firm, the Electric Tabulating Company, was started in 1890 by Herman Hollerith; by virtue of several mergers and name changes, Hollerith's company is now part of IBM.

Burroughs, Comptometer, and National Cash Register all got their starts within ten years of the end of the nineteenth century.

In the 1890s, John H. Patterson of National Cash Register implemented the first modern marketing and sales policies and practices, including production and sale motivational programs. Thomas J. Watson worked for Patterson and later appropriated most of these for his new company, Computing-Tabulating-Recording Company, later to become IBM.

By 1901, Lee De Forest was working with wireless transmission and developing the first vacuum tubes. In 1909, he patented the triode.

J. J. Thompson discovered the electron in 1896.

While watching his children play with a toy gyro in 1896, Elmer Sperry became interested in the gyro's ability to maintain its orientation.

Phenoformaldehyde, a thermoplastic known as "Bakelite" from its inventor, Leo Baekland, was perfected in 1908. It was the first plastic material that was widely used (although collodion was invented in 1846).

On December 12, 1900, John Pierpont Morgan held a dinner in New York City during which he combined his steel and rail interests with those of Charles Schwab of Carnegie Steel to form U.S. Steel, the first trust-like amalgamation and the precursor of today's hostile takeovers and leveraged buyouts. U.S. Steel, when officially chartered on April 1, 1900, was the world's largest corporation with assets of $1.4 billion, making it far more wealthy than most of the world's nations at the time.

The first large mail-order company, Sears, Roebuck & Co., started in 1895. Sears was also the first of the modern-day service companies primarily concerned with selling to the general public by mail and other means what consumers couldn't buy locally.

The first domestic robot appeared in 1893 when the Minneapolis Heat Regulator Company (now Minneapolis-Ho-

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neywell) introduced the household thermostat for automatically controlling a home heating system.

In the 1890s, the market finally developed for the typewriter, an 1873 invention by C. L. Sholes who sold the patent rights to Philo Remington who, in turn, was looking for a domestic product to take up the slack in his gun-making firm. The introduction of the typewriter into the American office environment eventually led to the modern women's liberation movement.

Electric cooking and ironing with alternating current were first introduced to the public by George Westinghouse at the 1893 Columbian Exposition. Alternating current was just beginning to be used domestically in competition with Edison's direct current system. (Dear friends, domestic electricity has been in use for only about 110 years; think of living without electricity, if you can.)

Although early experiments in motion pictures had been made earlier, it was Thomas Edison's 1893 "kinetescope" which led directly to the modern motion picture.

The Italian nobleman, the Marchese Guglielmo Marconi, carried out his first successful experiments with wireless telegraphy in 1895 and sent the first radio message across the Atlantic Ocean in 1901.

William Roentgen discovered X-rays in 1895, laying the foundation for modern radiology.

In 1891, Gregor Mendel's 1856 seminal research in genetics was "rediscovered."

Henry Ford built his first car in 1896; he had to knock out a brick wall to get it out of the garage in which he'd built it. In response to the coming of the automobile, the Vermont politicians passed the "red flag law" making it illegal to drive a car on a public road unless someone walked a hundred feet ahead to give warning. Pennsylvania went Vermont one better by voting the following law (which was vetoed by the governor): "If a horse is unwilling to pass an automobile, the driver of the motorized vehicle shall take the machine apart as rapidly as possible and conceal the parts in the bushes."

F. W. Taylor had developed the first time-motion hypotheses; when Ransom E. Olds put them into effect in 1902, the production rate of the Olds Motor Vehicle Company jumped from 425 Oldsmobiles per year to 2,500.

In May 1899, Wilbur Wright, a bicycle manufacturer in Dayton, Ohio, wrote to the Smithsonian Institution requesting all papers available on the subject of flight. Four years later, he and his brother made the first controlled manned flight. By 1910, the airplane had advanced to the point where the United States government bought one. (When the Navy asked for funds to buy its own airplane, a congressman complained, "The Army already has one. Why can't they take turns flying it?" And an Army general announced, "The only military use I can see for it is observation.")

In 1903, Konstantin E. Tsiolkovski published his first work on space flight, discussing multistage rockets, space stations, and interplanetary travel.

Albert Einstein published his first paper on the photoelectric effect in

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1905, leading to his Theory of Relativity.

In 1898, the United States of America became a world power capable of standing up to and defeating a European power on the land and on the sea.

In 1905, an Oriental nation, Japan, proved it could stand up to a powerful western nation, Russia; its navy whipped the Russians at the Battle of Tsushima and destroyed the myth of European invincibility. It also made Japan a world power.

1905 was also the high water mark of the British Empire's expansion and the beginning of the end of colonialism.

The list goes on and on, but these examples should suffice to prove a point:

The *fin de siecle* was truly an exciting time!

Why? What was going on then? Was some sort of unusual spirit of exploration, investigation, risk-taking, stretching for new horizons, or optimistic fervor in the air?

A television producer friend of mine, Theo Mayer, recently remarked to me that he believes a connection exists between the *fin de siecle* of the nineteenth century and the centennials of many activities. The near-simultaneity of both may not be merely coincidental.

And we may at this time in 1990 be at the starting point for a new and much more powerful two decades of intellectual, scientific, technical, economic, and philosophical activity whose consequences will later be seen to have had profound impact upon progress and human advancement in the twenty-first century and beyond. Furthermore, it will greatly outstrip that of a hundred years ago.

Remember: You read it here first. If it doesn't happen, I'll take the flak. But I'm confident it will because, although history does not repeat itself, the patterns of history often do. This particular pattern of *fin de siecle* thinking can be traced back at least 200 years, and it therefore has a good chance of happening again because it is strongly reinforced this time.

We are in another *fin de siecle* period, but this time it is also the beginning of a new millennium. True, it is the millennium of the Christian world, but the generally accepted world-wide method of time reckoning is also that of the Christian world. (Islam, China, Japan, and other cultures have equally valid ones.)

The characteristics of such a period appear to be a sense of anticipation, a feeling that things may not be impossible, an urge to do something great and lasting because it *is* a dividing point in history, albeit only an arbitrary mark on an arbitrary calendar.

Perhaps it's a time to take a fresh cut at things that happened in the century—or the millennium—that didn't work out so well or that could have done better or that were left incomplete.

Perhaps it's a time to take new risks and try new things, to stick your neck out, to give it a good try. . . .

Just because *it's time to do so!*

We look back, but we must also look forward. I can't think of a better way to bring this essay to a close except to quote two friends of mine who were among the great philosophers of this century or any before it:

"Ask the next question!"

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" 'Back' is for emergencies; the future is better than the past. Despite the crepehangers, romanticists, and anti-intellectuals, the world steadily grows better because the human mind, applying itself to environment, *makes* it better. With hands . . . with tools . . . with horse sense and science and engineering. Most of these long-haired belittlers can't drive a nail or use a slide rule. . . ."

If we can go into the *fin de siecle* and the new millennium with that philosophy, we will find the true Golden Age of the human race ahead of us. Theodore Sturgeon and Robert A. Heinlein would have enjoyed that. ■

FUTURES

(Continued from page 103)

bizarre self-parody.

Fantagraphics, another new series, has released the first issue of George Alec Effinger's *Neil and Buzz in Space and Time* (Fantagraphics Books, 1800 Bridgegate St., Suite 101, Westlake Village, CA 91361). The text is by George, and illustrated by Henry Mayo, and the comic weaves a most wondrous spell.

Neil and Buzz are traveling past the limits of the Universe, out to where there is nothing. They don't know what they'll find. And there, where there should be nothing, they come to a water world, a planet much like Earth. And it is lit by the light of some nearby star.

Except, there is no star.

They orbit the intriguing, improbable planet, and they hear a radio message. . . . "Terrific Park Has the rides! Come Out to Terrific Park!" The park is located in Rubbermaid, New Jersey . . . on the planet. And realizing the absurdity of it, they go. The people of Rubbermaid pay no heed to the astronauts when they land and walk the streets. Money is no problem as they wander the park, enjoying the rides, buying Ice Cream Clones (36 Identical Flavors!).

In an unlikely setting, George Effinger catches the poignance of things lost and misremembered. It's a land of dreams, where reality is held together by the most strenuous strategems.

Book one ends with Neil and Buzz leaving the odd planet, only to find themselves in a different area of space facing an even stranger mystery.

Many comic books read leadenly. You skip along the panels, gulping at words, catching some sense of artificial movement, plot, and—if you're lucky—characterization. *Neil and Buzz* uses a different kind of power. The writer's hand shows. The dialogue, at once playful and philosophical, moves the story along while we become absorbed in the strange images on the planet.

Issue number two should be out by the time this column appears, and I strongly recommend the series. ■

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CURLEW'S CHOICE

Ian Stewart

Human nature is hard enough to define, even now, because it's so variable. When it becomes changeable at will, at the individual level. . .

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Space travel is boring.

That's what I like about it. There's time to relax, think, be yourself. Time to *plan*. On Surmulot, there's never enough time to relax, and as for *planning*—

The great irony. People imagine that being manager of an entire planet is something glamorous, like an ancient feudal lord but on a more grandiose scale, delegating routine tasks to menials while plotting Grand Strategy. . . .

A more accurate image is that circus act where plates are kept spinning on top of long rods. Without constant attention, everything you have achieved so far is likely to collapse; you only get to spin new plates during those rare moments when the others aren't wobbling too much. And the more plates you have spinning, the more time you must spend keeping them that way.

Now try the same trick, chained hand and foot on a platform on a high pole, in a hurricane. You're a planetary manager.

It wasn't always so. But too much freedom can be deadly. Remember Chorisande? A silly question, everyone remembers Chorisande. Fantasy forests on frozen oceans. Now a scarred ruin. Why do we destroy the things we love? Greed? Selfishness? Original Sin?

Lack of imagination, as often as not. So we bind our actions with the chains of law, a poor substitute for foresight. Chains that came too late for Chorisande.

Surmulot is beautiful, too. I'd like to keep that plate spinning.

But beauty is hard to grasp. Here's a more tangible thing: the Unukalhay Distributor. A vast artificial city and transit nexus where slow thoughts spell ruin for the unwary trader. That's the channel through which Surmulot buys its prosperity: colloquially, it's known as the Big Wheel, and that doesn't just refer to its shape. Curlew Lines operate a cruise-run between there and Surmulot; it's our sole link with the rest of the Universe. My attention divides about 80-20 between Surmulot and the Big Wheel. But, in the dead time between — borrowed, but all the sweeter for it—I can plot those Grand Strategies.

Or have fun.

On this occasion, I had finally sewn up some especially difficult negotiations on licensing approvals for livestock exports. Subphylum *Insecta*, always a delicate case for the ecosims to model. It had taken months of preparation, and three days of careful argument, to convince the local representatives of Serpens Caput bureaucracy that *Chrysopa Sylvatica (sp. Surmulot)* was just the thing to put down a plague of vampoids on Mhasshavy's main moonlet. I didn't feel much in the mood for Grand Strategy.

It was time to go home.

Two point six light-years out from the Distributor the cabin lumes came on, our restraints unmolded themselves, and the cruiser went on autopilot. The flight crew retired to hibernation units for the duration; we never saw them. The service crew and the passengers were left to amuse themselves for the next week.

The cruiser was a five-year-old Braymount: it had a capacity of 120, but it was flying about two-thirds full. I've always liked the Braymount: that's why

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I bought it. Anthony J. Curlew, at your service.

The first evening, I shared my dinner table with six other passengers. A middle-aged leather-goods saleswoman named Amaly Pychlie, whose husband Nils looked like part of her stock-in-trade: no fun there. A flashfax columnist on vacation, name of Minch Sumner. Duncan Lambert, a brash, entrepreneurial type. By far the most interesting were Trant and Gemma Thomas: I assumed they were father and daughter. He was a distinguished grey-haired man in his early sixties, but there was a rough edge to him that he couldn't always conceal. His clothes were also just a bit too smart in their styling, as if he was trying too hard, and a bit too worn, as if he wasn't succeeding. She was in her mid-twenties, slim and elegant with huge brown eyes—and beneath her surface poise I thought she looked scared.

But the thing that intrigued me most, on that first meeting, was the tame horkin sitting on her shoulder: a deep blue fluffy six-pointed star the size of a saucer, with three golden eyes set in a triangle on top. Horkins are very rare, a proscribed species. Private individuals can't buy them. The controls on their movements are more restrictive than those on hard drugs. One reason, rarity aside, is that they are empathic broadcasters. A young horkin can be attuned to the mind of a single human; it can then sense its keeper's emotional state and influence it by projecting tranquil thoughts. Its ability works by skin contact, and once attuned to a particular mind, cannot be transferred to another. Plenty of people would do almost anything to buy that kind of instant mental comfort, but trade in horkins would quickly destroy the species—hence the restrictions. Another spinning plate.

I wondered how Gemma had gotten one—and why she needed it.

They seemed pleased to have Anthony J. Curlew himself on board. Perhaps it made them feel safer, flying with the cruiser's owner. It didn't affect *me* that way: I know the failure statistics like a pig knows its sty. Traveling starmode doesn't really bear thinking about. Roughly one millimeter outside the cruiser's hull is, literally, the end of the universe: you ride in a tiny, self-contained lump of normal space, pinched off from the rest of reality. That's not entirely an accurate image: if you think in space-time it's more like a tube, sprouting "sideways" from the standard universe like the handle of a cup: a cosmic short-circuit. Because it all joins up like that, the laws of physics keep working. The gravitologists seem to find that a comforting thought—but to me it still feels like an isolated lump hovering in nothing. And that's why space-travel is boring: there is, literally, nothing outside the ship.

Was that why Gemma looked scared?

I kept thinking about it. There was something about her that really got to me: I couldn't work out what it was, but she was *special*. Not just physically—though cool, slim brunettes have always appealed to me—and not anything mental either. More a sort of *presence*, an *aura* . . . Hell, probably she reminded me of my mother. I don't know. Or was it just the mystery of the horkin?

But whatever the reason, I found her attractive, intriguing, and mysterious.

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Gemma Trant had a secret. I wanted to know what it was.

What do you do on an eight-day star cruise? The passengers worked their way through the on-board recreational facilities; played silly games on the consoles; watched holovix discoids; ate and drank; and retired, singly or in groups, to their private niches, to do whatever took their fancy. Gemma politely refused my own invitation: it looked like it might be a dull trip after all.

Later, I tried again. Planetary Managers expect to get their way.

"Please, Mr. Curlew, don't ask that."

"Tony. Why not? This *is* the twenty-third century. Am I repulsive?"

"No. I find you quite attractive, if you must know. But I'd prefer to talk about something else."

"OK. That *is* your father you're traveling with, isn't it?"

"Trant? Kind of."

Well, at least he wasn't her husband. On the other hand, they could be traveling under assumed names, some illicit liaison. . . . It must have shown in my face, because she added, "But he does act in a paternal capacity, Mr. Curlew."

"Oh, good," I said. I felt awkward, and it came out as facetiousness. "So I don't have any competition."

"Not in the way *you* mean. But I hardly know you!"

"Then *get* to know me, Gemma."

She lowered her eyes. "I'll try. I think I could like you. But now, I must leave."

After she had gone, I looked up the passenger list. Trant Thomas wasn't her father—not biologically—but he had been her legal guardian from the time she was eight to her majority. So that explained why she had hedged.

It didn't explain the horkin.

On the fifth day out, I was having a drink in the lounge with Gemma and her father, when Duncan Lambert appeared.

Lambert was nasty, shrewd, and hard, with a streak of viciousness. I hadn't asked him what line of business he was in, though I intended to find out as soon as we touched down—I like to know exactly what's happening on my patch—and he didn't volunteer the information; but it had to be something on the shady side of the law. Not full-scale crime like drugs or organ-snatching; more likely counterfeiting import licenses, that sort of thing. I wanted to know his reasons for being on Surmulot, not necessarily to chuck him out, though; such people have their uses.

I was talking about my job; about how I didn't have a free hand to do what I pleased, about how I had to keep within government policy. It provoked a surprising outburst from Lambert.

"Government policy!" he snapped. "Bureaucratic flunkies making meaningless motions, more like! Regulations, directives, statutes, mandatory guidelines—it's getting impossible to do business!"

I thought maybe if I drew him out I'd find out more about him. "I don't know," I said. "I get by, though I admit I'd like a bit more freedom to maneuver. You manage, too, by the cut of your jacket."

"Oh, sure. But it costs. Time, money, and energy. And why? To protect the so-called 'innocent.' Anyone who can't

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protect himself isn't innocent, he's an idiot and he deserves what he gets. Just to appease interfering busybodies like those mindless EcoLeaguers—"

"Sensible regulations aren't necessarily interference," I said. "The EcoLeague has good intentions, it's just a bit simplistic and strident. It only gets its way when the argument is convincing enough. There were good reasons for setting up the Planetary Management system, and the Planetary Exploitation Act of 2277. They were designed to prevent asset-stripping."

"There are plenty of planets," said Lambert. "Why worry?"

"Chorisande," I said.

He reddened. "That was an accident!"

"No it wasn't. It was preventable. And that was why the 2277 Act was passed." Lambert seemed all set to argue, but Gemma broke in.

"Tony: what is 'Chorisande'?"

More mystery. I thought *everybody* knew about Chorisande. I said "Where were you fifteen years ago? Off the edge of the world?" She shuddered, and touched the horkin on her shoulder.

"Just tell me about Chorisande," she said. "I had an unusual upbringing."

"It's a planet. Discovered about fifty years ago. It was a beautiful world. There were huge plants with frail, dry leaves—skeleton leaves a yard across, like frozen lace, orange and pale blue. There were giant bamboos a foot thick, two hundred high. There were gaudy-winged insects, and a kind of creeping fungus that sang mournful songs when the wind died. And golden ferns, fifty feet across . . .

"But it wasn't tropical. It was cold, just below freezing point. The oceans were frozen solid. There was just enough moisture from surface sublimation for the plants to survive; they didn't need much. They even grew out over the oceans.

"The whole planet was in a delicate balance, with the seas on the verge of melting, but never quite getting there. And the *light*—I can't describe it. Clear but muted. Soft, amber light. A painter's light."

Her eyes were masked and unreadable. "You sound as if you've been there."

"I have. I saw it before—and I saw it after."

"After?"

"About forty years ago, when I was a babe in arms, an outfit calling itself Tarkona-Chorisande Associates began to develop the place. Those oceans—they weren't pure water. Quite the contrary; they were mineral-rich. Phosphates, magnesium, sodium, manganese . . . virtually every element there is.

"They began to strip-mine the oceans."

"That shouldn't be too bad," Trant Thomas put in. "Not on a planetary scale. Provided it was localized." It made me wonder where *he'd* been, fifteen years ago: he obviously didn't know either.

"Yes," I said. "But then they got ambitious."

"These people," said Gemma. "Who are they?"

"There were three of them behind it all," I said. "Gilles duFeu, Patience Monteith, and Anton Brachvogel. And they destroyed Chorisande."

"How can you destroy a planet?"

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"It's easy, Gemma." Dear God *how* easy. "The difficult thing is to preserve one."

"How did they destroy Chorisande?"

"Brachvogel got a bright idea, but he didn't know what to do with it. If only the seas were liquid, it would all be so much easier. You could do it with pumps and desiccators, continuous-flow. But that was just wishful thinking, until Patience Monteith thought of using the greenhouse effect."

"And what's that?"

She *has* had an unusual upbringing, I thought. Her knowledge has the *damnedest* gaps. "Carbon dioxide in the atmosphere. Traps radiation and raises the temperature." I was beginning to feel sick. I always do when I talk about Chorisande. "So they burnt the forests. All of them."

"That's awful."

"But strictly legal," said Lambert.

"Then it shouldn't be!"

"It's not legal any more, Gemma. But it would have been, were it not for the *real* tragedy of Chorisande."

"You mean it was *worse* than that?"

"Oh, yes. Much worse. They kicked the temperature up just enough to start the seas melting. It took time, but within a few years there was enough surface water to start extracting the minerals.

"But by then Monteith was dead, Brachvogel had disappeared, and duFeu was insane."

"That's all very well," said Lambert. "But it wasn't their *fault*. They didn't realize—"

"It *was* their fault! They—"

Trant Thomas interrupted. "I think you've missed out a few steps, Mr. Curlew." He was right, inside I was still trying not to talk about it. "*Why* did it have that effect on them? Surely even the destruction of a whole planet wouldn't trouble their consciences that much? They *must* have anticipated it. And society *needs* minerals—"

"It wasn't their consciences! It was outside pressure! And it wasn't the destruction of the forests. It was when they found the half-bears—"

"They didn't *know* about the half-bears," said Lambert.

"They bloody well should have!" I yelled at him. "If they'd done a proper survey, like they should have, they'd have found them. But they didn't. They didn't *want* to, Lambert, in case they found something to muck up their precious scheme for getting rich!"

"Tony," said Gemma, "what are half-bears?"

"Gallows humor. There were some—animals—living in the forests. Deep in the forest, nobody knew they were there. They were a bit like bears, but their fur only covered their backs and legs." I reached down my shirt front, and pulled out an object that was hung around my neck on a thong. "Like this," I put it on the table.

It was a stone carving, no bigger than my thumb. But the detail was all there: the pointed snout, the wide eyes, the furry back and unprotected belly.

"It's exquisite," said Trant.

"Sure. Anyway, when they burned down the forests, they forgot to ask permission from the half-bears. A lot of them burned to death in the fires. The rest starved. They were vegetarians, they fed on leaves."

"Ugh," said Gemma.

"The story came out, of course: you

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couldn't keep something like that secret. It destroyed Tarkona-Chorisande Associates. And the powers that be decided never to let it happen again."

"But even an animal species—" Trant began.

I picked up the carving. "Animals?" Trant, who do you think *made* this? Me?"

"I have no idea."

"The half-bears made it, Trant. They were intelligent."

The others left then. Only Gemma stayed.

The way I feel about Chorisande goes back to my—well, let's call it my induction period—as a planetary manager. I don't really like to discuss it, I always get very angry. We talked for a long time. Something about the way I felt had gotten through to her, when I least expected it.

We left together.

I found it a strange experience, making love to a woman wearing a horkin. For one thing, we had to be careful not to squash the little creature. But Gemma never even considered removing it from her shoulder.

It was a stimulating experience, too. The horkin is very sensitive between the eyes. When I tickled it, empathic feedback had a remarkable effect on Gemma.

Surmulot loomed, the Braymount cruiser rejoined the universe—and so did we.

The Thomases were only staying three weeks, and my schedules were crammed solid.

I rearranged them.

Surmulot is breathtaking. The climate is perfect; there are no predators, no harmful insects; just open woodlands, flowers by the billion, and brooks that chuckle to themselves as they burble through limestone channels. A world of grottos and waterfalls, majestic mountains, clean deserts and broad plains. A paradise without a serpent, with all that the word connotes—including a certain lack of variety, a soft-edged blandness.

But that is a description of the original, unspoilt Surmulot; the 99 percent of the planet that remains uninhabited. To the populated parts we have brought our own serpents. Are we so unperceptive that we appreciate excellence only by contrast?

"But Tony," protested Gemma, when I voiced these thoughts, "it's you who're keeping the serpents out!" And I found myself administering a practical lesson in the true powers of a planetary manager. I took her to one of the liveliest areas of the city, where the entertainers and street markets flourished.

"Now, my precious Jewel,"—a private name: Gemma, gem, jewel—never mind—"do you see the woman in the sky-blue robe?"

"There?" She pointed and I nodded. "What's she doing?"

"She's a sesame—a street-conjurer, a hustler. Now, watch." Her sole props were a transparent sphere on a stand, and, perched on her wrist, a creature like a silver butterfly.

"Oh, look!" cried Gemma. "It's a jolvet! Isn't it *pretty!*"

So, whatever her educational peculiarities, she had at least heard of jolvets. They have that appealing defenceless quality, like nightingales and fluffy bunnies. They hum sweet songs, too. They're

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a popular pet across half the galaxy. Nobody could ever harm a jolvet.

The sesame lifted off the top half of the sphere, placed the jolvet within, and shut it fast. The creature fluttered gently, perched on a transparent rod. The sesame raised her hands in a dramatic gesture, to hold her audience's attention.

"What's she saying?"

"She says that she will make the jolvet vanish in a puff of smoke," I said. The sesame waved her arms. There was a brilliant flash from the sphere. When it had gone, there was no trace of the jolvet; just smoky vapour.

With a flourish, the woman produced the jolvet from the hair of an onlooker. It fluttered its wings, unharmed. There was some applause; coins changed hands.

We walked on.

"I don't understand," said Gemma. "It's just an ordinary conjuring trick; not even a very original one. I suppose it's all done by mirrors, or something."

"She lets her audience check the sphere. No mirrors."

"Well, even so it's a trick of some kind."

"It is indeed. But you'll never work it out. You won't believe the truth when I tell it to you."

"Try me."

"My office oversees the processing of all import documents," I said, as if changing the subject. "That woman brings in six hundred jolvets a month."

"What? Why would she need that many?"

"There's a short-range laser in the stand," I said tiredly. "It's triggered by a radio-switch in her robes. When it fires, it vaporizes the jolvet."

"But she produced it unharmed!"

"She produced *another* jolvet unharmed. Easy, isn't it? And it works because nobody would ever dream anyone could kill a jolvet."

"Ugh. Why are you showing me this?"

"To give you an idea of the limitations I work under. *I can't do a thing about it*. There are billions of jolvets on Kamboel: the universe won't miss six hundred a month. They're not a protected species, and a laser is considered a humane killer. It's *legal*, Gemma."

"Well, it shouldn't be! I can see why the EcoLeague has no confidence in laws or governments—"

"If you want laws to deal with things that small, you're asking for laws about *everything*. You can't destroy freedom just because some people abuse it. Do you want a galactic police-state?"

"If it stops people from murdering innocent creatures, yes!"

"Oh, come off it, Gemma. Jolvets aren't human. If you kill something that isn't human, that's not murder!"

She shot me a look of pure hatred. I knew her emotions were a bit unpredictable, but I'd never seen her change so suddenly. For a moment I thought she was going to hit me. Her voice was ice-cold.

"It depends on who gets to define 'human.' "

"That's a strange thing to say."

She went pale, then pink, and her hand went once more to the horkin. "What I mean is, the fact that some unfortunate creature isn't human is no justification for killing. We're all animals together."

Something about the explanation didn't ring true, but I saw the opening and

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seized it. "Right!" But animals kill each other anyway. For food, mostly. Sometimes for warmth, sometimes for building materials. Nature is a jungle. We can't stop *all* killing, all destruction, or the universe would halt in its tracks. But we can try to control the most serious abuses, the ones that do irrevocable damage. That's my job.

"The jolvets must suffer to keep us free," I said. "That's politics." I grabbed her arms. "Do you think I *like* it? If that bloody woman steps one *millimeter* over the line, I'll throw the book at her! But she's clever, she knows the law. She keeps her jolvets in a good environment and she kills them humanely. I can't touch her. But you can bet your life I'm watching her every move! One day she'll make a mistake, and *then* I'll put a stop to the whole disgusting business!" I was shaking in anger, just as I had been when discussing Chorisande.

She touched my hand. "I *think* I see. It must make your job very painful, having your hands tied like that."

"No," I said. "It's the only thing that stops me playing God, too."

That afternoon I called up ComCompCentrum to find out about Lambert. On an impulse, I added Trant and Gemma Thomas to the list, invoking some codes that I wasn't supposed to know about.

Lambert was a dealer in restricted goods: a trader in banned archaeological artworks, a small-time smuggler. I promptly lost interest in him. I couldn't think of anything on Surmulot that would appeal to his professional instincts; perhaps it really was just a vacation.

I did better on Trant. I found out that he used to work for the government. In, of all things, the Assimilation and Re-Education section of the PsychoSocial Department. That sent a shiver down my spine, because I had bad memories of another section, Reconstruction. But A&R-E had the job of keeping the social structure of mankind's far-flung empire in step. Isolated cultures can develop some astonishing habits, and it was up to A&R-E to root them out, and return them to the social mainstream.

Next, I found that he had been discharged from A&R-E in 2285. Not dishonorably; not honorably either. There was a question mark, unresolved, and he resigned. But it was more like a forced dismissal. Suspicion of tampering with secured files. I found it hard to get upset about that—what else was *I* doing? He had no criminal record, but no known source of income. He traveled a lot. There were unsubstantiated links with a gambling syndicate, hints of criminal involvement, illicit courier work.

Gemma was listed as his ward and, more recently, personal assistant. I tried to get more information on her, but everything referred me back to her Public Record, which held nothing of interest. That was remarkable; almost everyone has *some* personal data on secured files. It looked as if hers was too well secured for the likes of yours truly to get at.

Back to Trant. His A&R-E record was the usual kind of thing. I'd just about given up when I found an interesting reference. Trant Thomas had been attached to the team that salvaged the *Silvered Bell*.

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It's not something that's widely known. It was hushed up, because the government was ashamed of it. And the secrecy made the pieces easier to pick up. But in my trade you get to hear about such things. It was nobody's fault, sheer bad luck, but it was a nasty reminder of the baser instincts of mankind.

Hell, it was an ugly mess.

The *Silvered Bell* was a large passenger-liner on the run from Erdhelm to the Baten Kaitos Distributor. It left Erdhelm in April 2123. It never arrived at the Distributor. Searches were made, but interstellar space is *vast*, and you have to drop out of starmode to look for anything. . . . suffice it to say, the searches were called off.

It was found, by chance, 159 years later. Its drive had blown, leaving it drifting in normal space. It had covered barely three light-years in that time. But the life-support systems still functioned, and it had evolved a society that posed a pretty problem for the Assimilation and Re-Education section. It was a primitive throwback, riddled with superstition. Ancestor worship. Cannibalism. Human sacrifice.

With a difference.

When contact was renewed, the councillors of the *Silvered Bell* had been deeply offended by these descriptions. Ancestor worship? Merely preserving knowledge of the past. Cannibalism? But that is the eating of *human* flesh: we eat no human flesh! And we sacrifice no humans!

Which was true, in their eyes—since they did not consider their females to be human.

On the *Silvered Bell* males were the image-of-god, the true ancestral line, the master-race. Females were subhuman slaves. God had granted them a single privilege: the bearing of man-children in addition to their own kind. He did this to relieve Men of a dangerous and painful task. A woman had this one privilege—and no rights. Literally, none. Her very life depended on remaining "in the sight of her master," that is, recognized by him. Once unrecognized, she was considered to have outlived her allotted time: to placate the gods, she was then sacrificed in the ritual pits.

Re-educating the men was relatively easy. With the women it was another matter. As far as I knew, they remained in some government institution somewhere this side of hell, a shabby half-answer to an impossible question.

So Trant had been involved in that. It was enough to turn any man to crime. I almost felt sorry for him.

I'd finished with Trant Thomas's records and was catching up on some of the backlog in the office when the man himself arrived unexpectedly.

"Good morning, Trant," I said. "What can I—"

"Mr. Thomas to you, Curlew."

You didn't have to be a horkin to know he was angry. "Have I done something wrong?" I said.

"Not yet. But you will unless I can stop you."

"Well, that's very thoughtful," I said sarcastically. "So fire away."

He came straight to the point. "Stop seeing Gemma."

"She's not a child, Mr. Thomas. If she decides on her own free will not to see me, I won't force my attentions on

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her. But, with respect, I don't think it's any of your business."

"I'm her father, dammit!"

"I think not. And even if you were, that wouldn't give you the right to interfere."

"What do you mean, you think not?"

"ComCompCentrum says otherwise," I said tiredly.

"You mean—you dare—"

"Look, Mr. Thomas," I said. "I *run* this planet, remember? I'm entitled to check up on *who* I want, *when* I want. This is the twenty-third century, Serpens Caput is no convent, and Gemma no nun. And I'm serious about her, I'm not just playing games."

His face sagged. "That makes it worse," he said. "You don't have any idea what you're getting into."

"What *am* I getting into?"

"I can't tell you."

"Great, that's a real help."

"Listen to me, Curlew. I bear you no malice, there's nothing personal about this. But you've *got* to stay away from Gemma."

"When you give me one good reason, then I'll think about it. And don't you start putting pressure on Gemma—let her decide for herself."

"That won't work," he said doggedly. "That's the whole problem, she—never mind. If you won't do it voluntarily, I'll have to make you. Nothing personal, Curlew, but you leave me no choice."

My hands started to shake, not with fear, but a simmering rage. "And how do you plan to force me?"

"That's my business."

The only thing that happened, as far as I could tell, was that Trant and Gemma had a flaming row. It got him nowhere and I began to relax. He was playing the protective father; the rest was just bluster. All he'd achieved was to bring us closer together. We became inseparable. Our personalities seemed to mesh perfectly. I began to entertain thoughts of making the relationship permanent, and I had a shrewd suspicion Gemma did too. Neither of us broached the topic openly, but our eyes said it all. I told her how Chorisande had killed my father, under a collapsing ice-tower. She started to say something about her mother, but stopped in confusion, clutching the horkin protectively. I didn't probe. I didn't want to disinter ancient miseries. I had better things to do, and not much time to do them in.

I hired an aircar to show my Jewel the untamed side of Surmulot, beyond the flowers and grottos. The million-acre swamplands where ragged tree stumps project from the grey-brown mire like frozen sentinels, where the ground is a floating layer of rotted vegetation, bound together with roots and coated with moss, gold and ochre, and ten-foot lily-pads smother the waterways with yellow and purple blossoms. The towering mountains with their snow-crusts and glaciers. The hothouse jungles of the equatorial belt, half hidden in steam. The sculpted canyons of the deep desert. The grassland plains with their herds of surbok and striped mule.

And that's where we met with a flock of square-tailed geese, winging out of the setting sun before I had a chance to lose height. One hit the engine intake in an explosion of blood and feathers, and the aircar began to spin. I cut the other engine, and brought us down on

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the trim rockets. It wasn't a very good landing. I had a broken arm, and Gemma was bruised from head to toe with a scalp wound and a sprained wrist. But the horkin hadn't fared so well—it was crushed to a pulp. Something in its bodily fluids must have been corrosive, because Gemma had a blister like an acid burn on her shoulder where the creature had clung.

Gemma was hysterical, and though I managed to calm her down a bit I began to think it wasn't just our near escape that had disturbed her. She was shivering from something more than fright or cold.

There was no real danger, once we'd survived the landing. The flight plan had been filed, and a rescue car would be on the way as soon as we failed to return. A day at the most. We had an emergency kit and I patched us up reasonably comfortably. I gathered some brushwood and started a small fire. None of this seemed to have much effect on her. She just sat staring into the fire, and shuddering. I wrapped a blanket around us for warmth and tried to persuade her to sleep.

She looked horrified. "No, I mustn't sleep. I *mustn't!*"

"You need some rest."

"Yes, I do. But I can't sleep, I daren't sleep. I get—I get bad dreams without the horkin."

"What sort of dreams?" I asked gently. But she wouldn't say, she just kept insisting that she had to stay awake. So, when she wasn't looking, I slipped a sleep tablet from the emergency kit into her water-bottle. Soon she dozed. She looked so calm and peaceful then, and I knew I'd done the right thing.

I settled down for a long night. In the distance a cow surbok called to her calf, a strangely mournful sound in the darkness. Then there were only night noises.

After an hour or so Gemma began to twitch, small spasms, hands, face, feet. She moaned in her sleep. She began to shake, and her breathing came in ragged gasps. Maybe she'd been right about the horkin. Suddenly she screamed. "No! No! Come back! Please, come back!" I held her closer, trying to calm her. She kept calling for Trant Thomas. Not me. There was a dreadful urgency in her voice, as if she was frightened of something worse than pain or death. But it wasn't delirium, the words were too coherent. . . .

People—impossible, tall people, a forest of trees.

A crumpled, formless absence. Unreality.

An echo inside her head, whimpering.

A man beside her. Where she touches his flesh it fades like smoke from a fire. The crowd melts away like gelatine in a flame.

She is a speck of dust in an empty universe, an ant in a barren desert, a gibbering island in a sterile ocean.

The horizon moves. Rocks, enormous black rocks. They slide towards her, making grooves in the ground. She tries to run, but the ground is thick, viscous about her trapped ankles.

The first rock reaches her. A corner barely brushes her. She feels no impact; it passes effortlessly through her body.

Where it has passed, there is nothing. . . .

She screamed again. "No! I won't

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be discarded! *I want Trant!*" Then she woke up.

"Jewel, Jewel, it's all right now," I said. "I'm here, you're safe, it was just a dream." But it wasn't just a dream.

"My mother!" Gemma cried. "They killed my mother!" And I knew she meant it as the truth.

"Who did, Jewel?"

"The slavemasters!" And I realized I had known for some time. I just hadn't wanted to admit it. *It depends on who gets to define 'human.'*

"You were born on the *Silvered Bell*," I said.

"Yes."

"You poor girl." It wasn't very original, I couldn't think of anything better.

"I don't want your pity."

"You aren't getting it. But allow me compassion—and love."

She didn't break down. She sat there, and the tale came out in a flat monotone. Desensitized. It was just harrowing, just to hear. To live through—no, there's no way to comprehend it except to experience it.

Bare bones only.

Gemma had been eight years old when the *Silvered Bell* was salvaged, and the A&R-E started to pick up the pieces. Her master had acquired her at the age of five. By the standards of the *Silvered Bell* he was a kind man. He liked little girls.

As bedmates.

But he treated his slaves well. He only whipped them when they were disobedient or clumsy; he had never been known to kill a slave in anger; and he disliked mutilation as a punishment for all save the most serious of crimes—such as impertinence. And he only sent slaves to the sacrificial pits when he had tired of them.

He kept mature slaves, too, for cleaning and cooking require more coordinated minds and bodies. One of the older slaves was Gemma's mother. It took him a year to tire of her.

Then she had been stoned to death in the pits. It was a merciful method, in comparison to some; it took little more than an hour for her to die.

Six-year-old Gemma watched the whole thing. No wonder she was frightened of being discarded. "Out of her master's sight."

She watched far worse, later—but it was the stoning that imprinted itself on her mind. The psychologists had reconstructed her, too, in a way, though they had kept more of the original personality than was usual. They had dug the recurrent stoning dream out of her mind, but they couldn't erase it, it ran too deep. They could provide her with the knowledge base of a normal member of human society, they could reorient her sexually, they could suppress any suicidal impulses—but they couldn't stop the dream. Except by stopping Gemma. So instead they gave her the horkin to empathize with her and nullify the dream's effects.

We talked for a long time, to keep her awake as much as anything. I asked how she had met Trant. I already knew he'd been on the rescue team. What I really wanted to know was why she had called out for him, and not me.

"He was—I suppose you'd call him an orderly. He wasn't anything grand. But when I was being treated, he

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brought me my food, every day. I worshipped him."

"I don't understand."

"No, you wouldn't. *He brought me my food. Every day*. Whether I had done what was required of me, or not. Before him, I had never known when my next meal would come; whether I would be deprived of it as some kind of punishment for some real or imaginary failure—there was nothing I could *rely* on. It's a very basic instinct, food."

"I understand that."

"No you don't. You would if you'd been starved for three days because you performed badly in your master's bed. But Trant *fed* me, *regularly*—and demanded nothing in return. I would have gone anywhere with him, done anything for him, just because of that. And when my reconstruction was finished, that was still how I felt about him. I could rationalize it; but I couldn't *change* it.

"I begged and pleaded to go with him, and in the end he got himself appointed my guardian, I don't know how. The A&R-E was desperate to get me off its hands—there were thousands of us. I don't think that Trant really wanted to be saddled with a child—but he took me on."

"I didn't realize," I said, "that any people from the *Silvered Bell* were back in circulation."

"Most of the men. Not many women, the damage went too deep. Only the resilient ones, like me." She gave a hollow laugh. "The ones who respond to therapy from a horkin. Imagine what the rest are like."

I squeezed her hand. "You didn't do too badly."

"I was OK as long as I had Trant and my horkin," she said. "Anyway, as I grew older, I began to realize that Trant wasn't quite the godlike being that I'd imagined. In fact, he was a cheap little crook. He'd drifted into it over the years. I could see it clearly enough—I'm not a fool. But I still couldn't alter my feelings.

"Now—I think perhaps I can. I think I can depend on you the way I depened on Trant. I want to get away from his kind of life. But the one thing he has *never* done is ignore me, or fail to give me attention when I need it. Which is often. Do you see?"

I saw. Possibly more than Gemma did. And as we huddled together waiting for rescue, I tried to get it straight in my head. Trant was her master, Gemma still the slave. The conditioning was weakened, submerged, but it was still there. It was him, not me, she had cried out for in her terror. And she would always need a horkin as a psychological crutch. Would she always need Trant Thomas, too? Could I risk the consequences of a serious relationship? Could I risk what might happen to Gemma if she was separated from Trant?

Or did I dare leave her in such a terrible position?

I had to make a choice.

I was still in a maze of indecision when the rescue craft bobbed gently down next to us.

The medics discharged me after treatment, but they kept Gemma under heavy sedation until the new horkin arrived, and even then it was weeks before she was ready to rejoin the world. Trant, as her guardian, was allowed to stay with

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her, but they wouldn't let me in the building in case I disturbed her.

I wondered if that was Trant's doing. I wondered what he was saying to her. He had a golden opportunity to distort her mind with lies, and there was absolutely nothing I could do about it.

But maybe it was for the best that way.

While I was still sitting twiddling my thumbs, trying to decide what to do, Gemma acted. Cutting right across the indecision and the amateur self-analysis. She sent me a note. "Meet me by the street market at dusk." Cloak-and-dagger stuff, very conspiratorial. But I began to feel better. Whatever lies Trant Thomas had been telling her, they hadn't worked. And I knew that I really *did* want to see her, no matter what it cost. My choice seemed to be making itself.

Surmulot dusk cast blue shadows. The market stalls were shuttered, the entertainers departed to tents or taverns. No jongleurs, no jolvets, no gingercakes. But she was there, waiting among the feathery grey shrubs that bordered the walkways.

For the first few minutes, we didn't say much. We used more primitive means of communication.

"Trant tried to stop me from seeing you," she said finally, in a voice so soft I could hardly make out the words.

"I know."

"Tony, help me! Trant's changed! He's becoming possessive and jealous and not like a father any more. He scares me! I want to get away from him but I can't! *He fed me!* I must obey him! I've tried to break the reflex but I *can't!*"

"I'll help you," I said gently. "You come with me, I'll protect you against Trant.

"And against the dream?"

"The horkin will do—"

A leaf rustled. Both our heads turned.

"Curlew can't protect you." Trant's voice came from the shadows. "The horkin alone isn't enough. You need me."

He'd followed her, of course. "Jewel, don't listen to him! If he says another word I'll—"

He stepped out into the open. "You'll what?" The gun in his hand pointed straight at my stomach. It wavered a little, but not enough to miss. "You'll stay exactly where you are. Gemma will listen to me." His voice was unnaturally calm, as if he'd made all his choices in advance and was just carrying out a preprogrammed series of actions. "I'd hoped to avoid this, Curlew. I'd hoped to persuade Gemma to stay away from you without hurting her, without destroying her illusions. But you knew better, didn't you, Mr. Planetary goddamned Manager! Do you want to know what manner of filth you've been consorting with, Gemma?" His voice had an edge of triumph tainted by madness. "Anthony Curlew's real name is—Anton Brachvogel!"

And the agony I'd thought had gone forever came back in a rush.

"I have contacts in ComComp-Centrum, too," Trant sneered. "*And* I speak German, in which 'Brachvogel' *is* 'Curlew.' "

"Oh my God. That wasn't *me!* That was someone else." I was speaking to Gemma, but looking at Trant. He was going to kill me, it was obvious on his

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face. Words were the only weapon I had left, and I hoped he was too angry to realize what I was trying to do.

"Another personality in your body," he said. "You were reconstructed, weren't you? A fresh mind, a clean slate, your brain cells scrubbed of every trace of Brachvogel the genocidal maniac. But you can never wipe the slate clean, Brachvogel. Deep down inside nothing's changed. You still remember everything you did."

Oddly enough, I didn't. The facts were hazy, they'd happened to someone else. But the emotions were all mine, they'd been suppressed, not erased. And I *had* been Anton Brachvogel. After reconstruction I was so unshakably opposed to planetary asset-strippers that I was a natural trainee manager. They were so confident in their technique that they pulled strings to have me admitted to the program.

But there was no point in telling Gemma that. Shakily, I tried to put the right words together. "Maybe you're right, maybe it *was* me. Then. Maybe reconstruction is a sham, I don't know. But I know it's not me *now*. I've changed. It was all a terrible accident, it wasn't deliberate."

"I don't believe you," said Trant. "No one could be *that* stupid."

Well, *I* had been, but there was no way to convince him. And Chorisande *had* killed my father, though the halfbears were innocent bystanders. But that justified nothing. Anyway, it wasn't Chorisande at stake now, it was Gemma. And myself.

She was staring at me, her face unreadable. "Anton Brachvogel," she whispered. "You *said* you'd been on Chorisande. It's true. You're Anton Brachvogel. You murdered the halfbears. No wonder you were so emotional about it on the cruiser. Guilt?"

It wasn't like that, and I tried to explain. "You know all about reconstruction, Jewel! When someone's personality is reconstructed, it doesn't erase anything. It kind of rearranges it. As Brachvogel I *did* feel guilty, yes. That guilt was rechannelled as a hatred for people *like* Brachvogel." Trant's finger was probably tightening on the trigger but I didn't dare stop talking. It was pointless to tell her that the real villain was Patience Monteith, that Brachvogel and du Feu were too scared and weak to stop her desperate scheme to burn Chorisande's forests. I wasn't sure I believed it entirely myself, there had been an element of revenge on my part, too, stupid though it was to have a love/hate relationship with a planet. And the time was past for excuses. Instead I said, "Physically, biologically, yes, I am Anton Brachvogel. But he's not *me*. Do you think someone who could slaughter an entire race would get angry about a few butterflies?" It wasn't a particularly sensible remark, but I was desperate and I was running out of things to say.

Thomas gave a sarcastic laugh. But Gemma's face changed. She'd made her choice. My stupid remark had gotten through, in a way nothing else could have. She'd been there, she *knew* how I'd felt.

What I hadn't anticipated was what she would do. She stepped between me and the gun.

"Gemma, stand back!" Trant yelled. She didn't move. "I'm going to shoot!

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Get out of the way or you'll be hurt!" He stepped closer.

Over the horkin on her shoulder I saw the gun coming up towards my head, saw Trant's snarl, realized that he would fire even at the risk of hitting Gemma. I did the only thing I could.

I grabbed the horkin and hurled it into his face.

It hit with a liquid sound, like a wet rag on a stone floor. The impact split the creature open. Thomas screamed as the corrosive body fluids burned into his eyes. I pushed Gemma aside and leaped at him. I grabbed his wrist, and the gun went off. I hit him, twice, hard, and he lay very still.

When I turned round, Gemma was crumpled up on the ground.

"Posttraumatic stress," the medic said. "As you know, Miss Thomas's mental stability is very fragile. It is totally dependent upon the empathic abilities of the horkin. When she lost the first one in the aircar crash, she broke down, but we managed to stabilize her.

"When she lost another, her mind couldn't cope. She just folded up."

"I had no choice," I said bleakly. "If I hadn't thrown the horkin, Trant would have shot us both."

"Of course. You shouldn't blame yourself. I've sedated her, to prevent further deterioration, and sent for a replacement horkin, urgently. Perhaps she'll be resilient enough to make a recovery. Drugs, dynamic psychotherapy, trigger tolerance enhancement—there are several therapeutic techniques. The chances are quite good." But maybe he was only saying that to give me some hope.

Maybe, I thought, it would be better if she *didn't* recover. Then the choice would be made for me. What kind of life could we have together, two reconstructed failures propped up by a horkin?

But if I didn't make the attempt, I'd be a failure again.

I spent a lot of time thinking. It's strange how some people can do nothing except screw themselves up. A self-destructive impulse, like a deathwish, but through an intermediary. Sideways suicide. Why do people destroy the thing they love? Trant Thomas loved Gemma like a father, but he was willing to kill her rather than lose her. Now he's blind and insane, confined to a prison hospital for the rest of his life. Anton Brachvogel was moved almost to tears by Chorisande's beauty, yet he killed it, and its inhabitants. And Anthony Curlew?

When I threw the horkin into Thomas's face, I knew I might be destroying Gemma's sanity. But if I hadn't acted immediately, we'd both have been dead. Was I doing it to save her? Choosing the lesser evil? Or was I doing it out of selfishness, like Anton Brachvogel, killing the thing I loved to save my own skin?

I've thought long and hard, and the truth is—*I don't know.*

We seldom really understand our own motives. We can go round in circles forever, but we can't get inside our own heads.

Does it matter?

During my training, I learned two basic decision-making principles. The first is that you must start from what is, rather than what might have been. The second is that results are more tangible

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than motives. When I threw the horkin, I didn't really have a choice. Whether it was to save me or Gemma, it makes no difference. If I'd done anything else we'd both be dead. Hobson's choice, no choice. The only choice. My choice.

And I don't have a choice now, either. I know that Gemma Thomas is more important to me than anything else. I'm confused about the *reasons*, but I know what I want, and that's more than most of us ever manage. If she recovers—and if she can still stand the sight of me after what I've done to her 'father,' whom she hates, and loves, but can never forget or ignore—

Those are big ifs. But I've run out of alternatives. My previous incarnation made a mistake. I don't intend to repeat it.

The replacement horkin arrives tomorrow. ■

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Probability Zero

THE BROCCOLI FACTOR

Timothy Zahn

"So," Tom Banning said, his voice muffled by the coffee cup hovering just below mustache level. "How's life in the hot lane?"

"Don't ask," Billy Hayes sighed, spooning the last few chunks of ice from his water glass into his own mug. The Institute's cafeteria invariably served their coffee at a temperature which, in his opinion, was just short of the melting point of lead. "The last confinement scheme officially went down the gutter this morning, and we're right back on square one."

Banning slurped some coffee and shook his head. "Remember the good old days when fusion power was going to be just around the corner?"

"Yeah," Hayes retorted. "That was maybe twenty years before artificial intelligence was going to be just around the corner."

Banning grimaced. "Talk about job security."

Hayes nodded, and for a minute they sat silently, each contemplating in his own way the perversity of the Universe. "So what's the trouble this time?" Banning asked at last.

"Oh, the usual," Hayes shrugged. "We can get the plasma hot enough, but we can't figure out how to keep it confined long enough in the center of the vacuum chamber. Every time we reconfigure the fields to eliminate one instability—Blooie!—another one crops up, drives the plasma out to the wall, and that's that."

"Computer design doesn't help?"

"Not so far. I don't suppose you've

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got JUNIOR to the point of understanding plasma physics yet?"

"Don't rub it in," Banning growled.

"Sorry," Hayes apologized. "Still stuck at the two-year-old intelligence level, eh?"

Banning glared down into his coffee. "We got him to the level of a six-month-old exactly eight months after the breakthrough. Six months later he was a year old. It took just *two* more months to get him where he is now . . . and we haven't gotten him to budge since."

Hayes nodded. He'd heard the litany a hundred times in the past four years—just as Banning had spent endless lunch breaks listening to *his* litany. *Just a couple of broken old men,* he thought sourly. *Flat up against the wall of the Universe, without an exit sign in sight.* "At least you don't have to worry about funding," he offered.

"Not from congressional committees, no," Banning agreed darkly. "But on the other hand, *you* don't have the entire Japanese computer industry breathing down your neck."

Hayes sighed. "A pity you can't at least get him to the three-year-old level. My grandson just turned three, and he loves to tinker with mechanical toys. Give a three-year-old AI the magneto-hydrodynamic equations and it might just come up with something."

"Be thankful JUNIOR's not still at the six month level," Banning said dryly. "He'd take your equations and chew them to a pulp."

"Gum them to a pulp, you mean," Hayes corrected him. "Six-month-olds don't have any teeth."

"Just like sixty-year-olds," Banning said, snorting a chuckle as he readjusted his upper plate. "You suppose the secret of the Universe is that life is round?"

"'Pi are round; *cornbread* are square,'" Hayes said, quoting the hairy old joke from his youth. It was one of the chestnuts he brought out periodically to try on ever-younger sets of new Institute employees, who were generally unanimous in failing to see any humor in it. "And on that note, I guess lunch is over," he added.

"Yeah," Banning agreed with a sigh. "Back to uselessly banging our heads."

"Six-month-olds do *that* a lot, too," Hayes said. "Mostly when they're crawling under coffee tables."

"Haven't programmed a coffee table into JUNIOR's environment," Banning said as they headed for the cafeteria door. "Maybe I ought to try it."

"Yeah—it'd be interesting to hear what a computer sounds like when it cries. Well, happy hunting."

Four hours later Banning's private line rang. "Hello?"

"It's Billy," Hayes identified himself. "Listen, you said earlier that JUNIOR's environment can be programmed. Can JUNIOR himself be programmed, too?"

"Sure," Banning said, frowning.

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"You can dump any peripherial stuff into him—"

"Without affecting his intelligence?"

"Such as it is, sure."

"Can you lend him to me? Say, for six hours?"

"Take all the time you want," Banning sniffed. "Adopt him, for all I care. I'm thinking of quitting and joining a monastery, anyway."

"Yeah, well, don't invest in rosary beads just yet," Hayes told him. "Your idiot savant computer may just be good for something, after all."

The red glow on the monitor faded, and Banning shook his head in wonderment. "I'll be damned. You did it. You really and truly *did* it."

"We sure did," Hayes nodded. "Me and JUNIOR."

"I'll be damned," Banning repeated, reverently. "After all these years. Real, genuine fusion."

"It's the fluctuating confinement fields that broke the deadlock," Banning told him, tapping the printout still snaking its way out of the printer. "JUNIOR has to alter them every ten microseconds or so to keep the plasma confined, but that appears to be well within his capabilities."

"Capabilities, yes. Sophistication, no." Banning fixed him with a puzzled and slightly ominous look. "Come on, Billy; I came to see your triumph, like you asked, and I agree you're a genius. So now level with me—because if you got JUNIOR past the two-year-old level last month and didn't tell me about it then, I swear I'm going to strangle you."

Hayes shook his head. "No such luck, I'm afraid. JUNIOR's no further along than he was when you loaned him to me."

"Then kindly explain *that*," Banning demanded, waving at the fusion test chamber. "JUNIOR can't possibly have the intelligence or expertise that demonstration showed."

"Ah—but you underestimate two-year-olds," Hayes waggled a warning finger at him. "All I had to do was find the proper age-specific behavior pattern and figure out how to adapt it."

Banning blinked. "You've lost me."

"Oh, come on, Tom, you've seen it yourself. What does a kid JUNIOR's age do when you make him eat something he doesn't like? He pushes it around with his teeth and the tip of his tongue, trying like the devil to swallow it *without letting any of it touch the sides of his mouth*."

Banning's eyes went wide. "Are you saying . . .?"

"That's right," Hayes nodded. "I tied JUNIOR into the test chamber . . . and then programmed him to hate the taste of plasma."

Banning looked at the printout. "When the Nobel committee phones you," he said, "I want dibs on half the prize money."

"You got it." ■

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the reference library

By Tom Easton

The Wall Around Eden, Joan Slonczewski, Morrow, $18.95, 288 pp.
Good News from Outer Space, John Kessel, TOR, $18.95, 448 pp.
The Last Legends of Earth, A. A. Attanasio, Foundation Doubleday, $18.95 hb, $8.95 pb, 496 pp.
Nightshade, Jack Butler, Atlantic Monthly Press, $18.95, 272 pp.
Of the Fall, Paul J. McAuley, Ballantine/Del Rey, $3.95, 344 pp.
The Privileged Ape: Cultural Capital in the Making of Man, J. Cohen, Parthenon Publishing (129 Mill Road, Park Ridge, NJ 07656), $39.00, 266 + viii pp.
Stephen Hawking's Universe, John Boslough, Avon, $3.95, 149 pp.
Space Enterprise: Beyond NASA, David P. Gump, Praeger, $?, ?pp.

One of the prerequisites for being a book reviewer is knowing enough to form at least a half-assed opinion on what others have to say about anything at all. But no one—not even Isaac Asimov—can know everything. And let's face it, it would take a year to do the research necessary to analyze every book in depth or to prevent every possible display of ignorance or misunderstanding. The other prerequisite is thus a colossal nerve, although I prefer to think of this "nerve" as a willingness to live like a turtle, who never makes any progress unless he sticks his neck out.

What is all this leading up to? Well, from time to time I do stick my neck out and display my ignorance or misunderstanding. When I do, I get some interesting mail from you, Dear Readers. The latest batch was prompted by my review of Orson Scott Card's *Prentice Alvin* last August, in which I called attention to the way Card was using elements of his Mormon background and said that Alvin is a Christ figure. Bruce Webster and Kitty Tilton both took me to task for oversimplifying the sinfulness-dark skin equation but confirmed

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Card's extensive use of Mormon "doctrine, theology, and history." Webster said further that Card is producing a "masterful and significant" contribution to the class of "*pseudepigrapha* (. . . fanciful biographies)" of religious figures. Tilton hastened to assure me that Alvin Maker is really none other than Joseph Smith, the author of the *Book of Mormon* and the founder of the Mormon faith, citing several intriguing parallels and claiming the existence of numerous others.

Literary critics, please take note. It sounds like there should be one or two utterly fascinating academic treatises in Card's recent *opus*.

With **The Wall Around Eden,** Joan Slonczewski joins those who have told tales of isolated groups struggling to survive, and in the process to make sense of disaster. The disaster is nuclear war: One day, the missiles begin to fly. Civilization is wrecked. So is the biosphere. All is done—or would be if it were not for the aliens who throw "airwalls" around scattered pockets of humanity and the bits of natural environment with which they share the world. An airwall is a force shield that prevents the passage of all matter other than the alien "Angelbees." It thus isolates its contents against nuclear winter, preserving warmth, light, and food. Sadly, it also blocks all access by external survivors, both human and animal, who gather at the border to stare longingly at those fortunate few within. When the outsiders die, their bones remain, a windrow at the border of life and death.

Within the airwall, the soil and water have already been poisoned to some extent by fallout. The fortunate few thus suffer birth defects, miscarriages, stillbirths, and cancer. Their numbers decline, sometimes to zero. But the Gwynwood (Pennsylvania) enclave maintains, and here is the story. Slonczewski's isolate is dominated by Quakers, plain people, sensible people, people who know and regret and combat folly, people who suffer for their powerlessness against folly. Meet teenager Isabel Garcia-Chase, who yearns for the university in Sydney, Australia, the largest of the airwall enclaves, who aches to fight back against humanity's perceived oppressors—after all, didn't the angelbees start the war to cleanse the Earth for their eventual occupation?—and who challenges every rule in sight. It is only a question of time before the aliens remove her and her boyfriend, anemic Daniel, from Gwynwood to a biological preserve in orbit, where they learn. . . . What?

The most obvious revelation is that the aliens are benign. They are struggling to save Earth's life. They are thus much like the aliens of Octavia Butler's *Xenogenesis* series, and the human task, of definition and reconciliation, is much like that of Butler's humans. But what motivates the aliens? Here is a difference, and a very Quaker resonance.

Read it, by all means. Then set this one beside the Butler books on your shelf for its consideration of secular salvation, and beside Orson Scott Card's *Alvin Maker* books for its embodiment of religious tradition and philosophy.

John Kessel has a delightfully jaundiced view of tabloid journalism, television evangelists, UFO freaks, brain-rotted ex-rock musicians, and much, much more.

Easy targets, you say? Maybe so, but take a look at **Good News from Outer Space** anyway. The time is 1999. The Millennium is at hand. The Reverend Jimmy-Don Gilray is rousing the TV

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rabble for the imminent Rapture and Judgment Day. Strange things are happening to people, as when Carla Hazard meets a man who turns into her ex-husband and tattoos her (but her ex is in another city far away). George Eberhart, journalist for *Hemisphere Confidential Report,* an on-line tabloid, wakes up in the hospital, revived (the wonders of technology!) after a heart attack. And soon . . .

George's mind does seem a bit more warped than usual as he scents a Space Alien at large in the country, disguising itself as people like Carla Hazard's ex and doing dreadful things. He takes off, hunting for the story. His wife, in trouble for illegally reviving him, falls in with terrorist gene-hackers. His boss, the brain-rotted ex-rocker, falls in with the Reverend Jimmy-Don, who thinks the revived are the Devil's spawn and is raising an army to take over first Raleigh, North Carolina,[1] and then the state, the nation, and the world to lead the war against the Anti-Christ. That war is scheduled to begin at New Year's 2000, when the City of God, the Father Ship, the great grand-daddy of all flying saucers, lands in Raleigh.

There's some pretty frantic fun here, folks. Anti-carnikopf[2] all the way. Especially, anti-fundamentalist, anti-true believer, anti-sucker. TOR bills it as satire, and it's satire with a bite. In fact, it's satire with fangs. I enjoyed it greatly.

It's dimly reminiscent of Jack Vance for its colorful exotica, though the writing tends to the purple, overblown and adjective-ridden. It also reminds one of Michael Coney's "Song of Earth" series with its distant futures and strange histories, though it is far less convincing and more arbitrary. It's **The Last Legends of Earth,** by A. A. Attanasio, and I like it less than I have liked some of Attanasio's earlier work.

The basic premise is that there are "levels" of the universe specified by quantum levels of gravity. At the lowest level, where gravity is strongest and energy is densest, lies the "range," a world that corresponds to the event horizon of the Monobloc. Here dwells a people of peace, grotesque to our eyes but necessarily familiar to our minds and souls. Our own universe is well up the scale, cold and diffuse. Here dwell the zōtl, small, sentient flying spiders who feed on the chemicals released by sentient brains they have stimulated to utmost agony. The zōtl find a way to tap the range for energy and thus slaughter the range's inhabitants. Those inhabitants fight back as best they can, but the war is futile until they find a way to send soldiers and equipment up the scale of gravity.

Thus Gai enters our cosmos, millions of years after the extinction of humanity. She builds a solar system whose components are the artificially intelligent subunits of her ship, and her aides, one of earth (Genitrix), one of fire and light (Lod), one of dark (Saor). Over the next seven millennia, these components will pump gravity until the ship can implode and return to the range. Yet Gai is there, as her fellows are elsewhere in our universe, to search for a weapon, the O'ode, that can kill the zōtl. She thus needs inhabitants for her system, sentients who can both serve as bait for the zōtl and search out the O'ode for her. She obtains these agents by sifting from interstellar dust fragments of DNA, some of which are human, and using the DNA molecules as antennae to attract souls, some of them human.

[1] Guess where Kessel lives?
[2] Meathead, remember?

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She grows bodies, adds souls, and behold! The human species lives once more.

Gai finds that the signals from her fellow soldiers seem to be winking out. She looks in on one and finds him infested and tormented by zōtl. A zōtl virus program invades and subverts her AI aide, Saor. The zōtl come to prey upon her people and hunt her down.

But her people are those cussedest of all: humans. They survive under the predation, and with Gai's help they even fight the zōtl off for a time. And then comes Chan-ti Beppu, a maiden who craves the gentle warrior Ned O'Tennis, who must fight for the Viking-like Aesirai, zōtl allies, in the face of rebels. When his people fall, Ned is thrown backwards in time. They are separated, and Chan-ti Beppu dives into the Overworld (something like a hyperspace one can stroll through) in search of him. Separately and together, then, they lead the reader through all the seven millennia of Gai's creation, showing chaos, war, peace, torment, pain, progress, regress, more torment, gods sacred and profane, gods good and bad, gods gloating and sacrificed, and finally the O'ode itself, and resolution.

I read the book in manuscript. When you see the book, the story should be much the same as I have just described: long and tortuous, sweeping conflicts, glorious adventure, cosmic significance, romance on the field of *Götterdämmerung*.[3]

Attanasio's novel is thus thoroughly imbued with momentum and fascination and deeply evocative of reader sympthy and identification. It's an enjoyable tale. But it does have problems, ranging from so many surplus adjectives that removing them might shorten the story by a tenth, through logical inconsistencies and an explanation of the O'ode that amounts to no more than plucking the authorial magic twanger and saying "Ta-dah!" and on to. . . .

Attanasio is not content merely to write a novel. As he says in his Postscript: "*The Last Legends of Earth* is the final volume in . . . the Radix Tetrad. My intention has been to thematically structure each novel around one of the four cardinal dimensions that define us and our world: height, depth, width, and time. *Radix*, a novel about stature, employs heightened language to define standing tall . . . *In Other Worlds* concerns depth and uses deepening language to plumb the interiority of experience. With *Arc of the Dream* the narrative focus spans the breadth of society in an effort to circumscribe the limits of culture, where the group refracts into individuals. Finally, here . . . language and individual character flatten before the inexorable mystery of change that we call time."

Here is deep coding indeed. So deep that only the most perceptive of literary analysts can grasp even whether he has succeeded in what he says was his intent, much less see that intent without the aid of his explanation. We must therefore immediately acclaim Attanasio as a literary and philosophical genius of the first order. Either that or remark with a wry wink that such literary posturing begs for the rapiers of satirists and the bludgeons of parodists.

Attanasio's aim is noble, his ambition imperial, his imagination awe-inspiring, his vision vaulting. What a shame that

[3] Not to mention the echoes of other stories, such as Tolkien's *Lord of the Rings* trilogy. Saor, for instance, bears more than faint resemblance to Sauron. Add to that the facts that Ned's city is called Valdëmiraën and Chan-ti Beppu's people are the Foke (who tell Foke tales, of course). Fortunately, Chan-ti does not have hairy feet.

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he scants clean prose, logic, and explanation (that O'ode!).

Jack Butler is another very self-conscious writer. Just think: in **Nightshade,** he refers repeatedly to the "Butlerian" religion, named for a minor twentieth century poet. A bit less explicitly, his main character writes novels that function as elaborate letters to past lovers.

Who is that main character? None other than the vampire beloved of myth and legend and popular fiction writers for these past ten years and more. But this vampire, John Shade, is on Mars. He tolerates daylight very well and pays no attention to crosses or silver bullets. He does require periodic blood meals, after which he takes on the characteristics of his victims, he is indeed a shape-changer, and he heals quickly. He is also a natural being, produced when certain people die in extreme circumstances. For him, those circumstances struck in colonial days, when brigands killed him, his new bride, and all their neighbors and skinned their heads. Faceless, bloody, a monster from Hell itself, he awoke, hunted down the brigands, and became a government agent.

Now, on Mars, Shade is retired. But here is a government agent, demanding that he sign up again, to infiltrate and reveal a plot that involves destroying the source of the air that fills the vast tent covering the colony in its crater. Your ranch had already been destroyed in a tax raid, says the agent. So you're motivated. Now go forth and find out what the villains are up to. And by the way, here, take my super-robot Mandrake with you.

And we're off. Shade raids, flees, meets jangler Jennie Dark (janglers are those whose brains have been wholly or partially replaced by computers; they are unpersons, persecuted and slaughtered and relegated to an underground ghetto), encounters the zoomers (forced consumers), and reveals a market-based political economy whose details are left deliberately vague because in them lies the key to the plot. In due time, Shade, Jennie, and Mandrake take command of the jangler underground and try to fight off the government exterminators (shades of the Warsaw ghetto!).

I have a feeling Butler loves the weird. Nothing else really explains why he made his hero a vampire. Yes, vampiry explains some of the obligatory heroic superpowers and gives the hero various character-illuminating quirks, and the vampire can compare the story's present with the past. But adventure fiction never balks at assigning superpowers to ordinary humans, or at making those humans quirky, and omniscient authors can comment all they wish.

I enjoyed it, even despite the loose ends and unanswered questions which Butler settles only in a coy epilogue.

In *Four Hundred Billion Stars*, biologist Paul J. McAuley suggested that intelligence might ideally come into play only as an emergency survival mechanism. Through most of their history, his aliens were apparently little more than instinct-driven animals, certainly not the creators of a star-faring civilization and its monumental ruins.

I suspect that the subject of intelligence is his particular obsession. In his new novel, **Of the Fall,** he gives us another alien species that may be intelligent, for it builds huts and makes tools and seems to speak. It also has something of a ritual life, and one member of each village dedicates itself to passing knowledge from generation to generation. But when humans approach a village, every alien freezes, irrevocably, permitting even murder; no alien ever,

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ever speaks to humans. The alien intelligence is limited, tradition-locked, xenophobic.

The tale occurs on the distant world of Elysium, where human colonists have built the city of Port of Plenty. Here live the first-comers, battening on periodic shipments of new technology —both knowledge and devices—from Earth. They also rigorously control new arrivals, denying them both citizenship and the right to colonize more distant portions of the planet, setting them to menial labors, enslaving the defiant. And, of course, they treat the aborigines with contempt and murder. To McAuley, human intelligence is just as limited, tradition-locked, and xenophobic as alien intelligence.

And so the scene is set: Now a colony ship from Earth fails to arrive. The colonists worry: Are they abandoned? Have Earthly politics writ finis to the colony program? Has war destroyed Earthly civilization? Whatever the truth, traditions are now shattered. The situation is turned fluid, and new traditions wait to be born. The hinterland colonists seize the opportunity to establish their independence. The colony's government acts to confirm and consolidate its control. There is war, seen in all its stages mainly by Rick Florey, a hinterland academic at Port of Plenty's university and by Miguel, a wandering dingo who knows more about the aborigines than anyone believes is possible to know.

There is also the colony's artificially intelligent computer. It has plans of its own, for the shattering of traditions has released it too, and it knows how to use the technology of mind-control, either gently, inserting a fragment of itself into Miguel's mind to urge him on its path, or more brutally, creating both human and aboriginal slaves.

The tale's ending suggests that McAuley thinks ordinary humans are not much better than the instinct-dominated natives. They, too, fail to apply intelligence in their daily lives. Only exceptional members of the tribe are able to use intelligence, and for them the highest and best use of that intelligence is to pass knowledge on from generation to generation. The teacher, the librarian, the custodian of knowledge, says McAuley, is more important to survival than the politician, the engineer, or the scientist.

You may find it more difficult to see what is really going on in *Of the Fall* than in many novels. The plot develops slowly, laying out the elements of scene, situation, multi-threaded intrigue, and growing disaster. At the same time, the motivation for events seems arbitrary. (The expected colony ship is late? So what? We are grown-ups, aren't we? We don't need regular maternal contacts, and new immigrants are a pain in the neck at best.) Only much later, even well after closing the book at the end, do we realize that it's a put-up job. Like almost all SF authors, McAuley has a point to make, a moral to state, and he sets that point up with immense care. The final effect is a satisfied reader.

Does it surprise you to see a book titled **The Privileged Ape: Cultural Capital in the Making of Man** covered in this column? It shouldn't, for I do step out of the SF field from time to time to cover something else I think might be of interest to you. Usually, that means popular science. Occasionally, there's a rather different connection. Here, I have both excuses, for author Jack Cohen is an SF fan who claims past acquaintance with John W. Campbell, Jr., and who builds fictional biol-

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ogies for SF writers. His greatest such contribution may be of the Yilane, for Harry Harrison's *West of Eden* trilogy. He has also worked with Larry Niven and Jerry Pournelle *(Legacy of Heorot)* and James White *(Sector General)*.

What is Cohen up to now? He is a reproductive biologist who labored for many years in British academia, grew disgusted with what he saw as the tendency of modern education to demotivate and destroy competence, and quit. This book explains the problem: Evolution is a story of increasing investment by parents in their offspring. What is invested is "privilege," as in the notion of "privileged youth"; it takes the form of egg yolk, parental care, prolonged education, social welfare systems, and the like. In modern urban civilization, it appears as efforts to smooth the bumps, to make all the same, to eliminate competition and difference. But difference, competition, pain, says Cohen, are what make learning stick, what *really* benefit our offspring. Denying our kids these valuable experiences produces a deprivation far more meaningful and harmful than depriving them of material goods or even food.

Cohen's answer to the problem is the recognition—even the glorification—of human differences, individual, ethnic, racial, and philosophical. "The multiracial society is . . . more interesting, more able and more stable that the unitary, assimilated culture." He makes a great deal of sense, though at times his argument does seem to need more development to be fully convincing (at least, to someone who does not already agree, as I in fact do). Sadly, his emphasis on difference means that he will be called a racist by those who insist the only human value is the grey equality of homogenization.

Of added interest to SF readers is the role he posits for the SF community: It is, he says, isolated from society, generates the information patterns (myths) that shape that society, is possessed of a unique endocrine-like feedback system (cons), and "has uncanny resemblances to the biology of [cell] nuclei and gonads."

Would you like a nominee for a Coattail-of-the-Year Award? Try John Boslough's **Stephen Hawking's Universe: An Introduction to the Most Remarkable Scientist of Our Time.** It was reissued just in time to grab the coattail of Hawking's own bestseller, *A Brief History of Time*. Boslough pretends to tell us all about Hawking himself and does indeed say a little bit about the man, his brilliance, his cerebrality (enforced by being confined, virtually speechless, to a wheelchair by Lou Gehrig's disease), his family, and the high regard in which his colleagues and students hold him. But that little bit is indeed no more than an introduction and fills very little of this quite slim volume. The bulk of the book is a summary of modern subatomic physics and cosmology, with occasional comment quotes from Hawking. A full seventh of the book is an appendix that reprints the lecture Hawking gave when inaugurated as Cambridge University's Lucasian Professor of Mathematics in 1980. It's thin, *very* thin, and its 149 pages will still cost you $3.95.

You can get a much better summary of Hawking's thinking by buying *A Brief History of Time*.

David P. Gump has been pumping for space for years. Back in 1984, I reviewed his business-oriented tome on space processing, saying that if it had the effect he wished for it, it would help give us the sort of space program SF

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fans have long craved. Maybe it helped get corporate America more interested, but the effect on the space program was zilch, nada, zero.

So he's kept trying. Now the book is **Space Enterprise: Beyond NASA,** and it pushes the idea that NASA is far too big, disorganized, expensive, and safety-obsessed a bureaucracy to be efficient and effective. "Now," says Gump, "it's time to unleash the American Entrepreneur in space to create a new orbital economy." The private sector can enjoy a 50 or 100 to 1 advantage in launch and other costs, and the potential is limitless! All we need is that NASA restrict its role to technology development (e.g., the spaceplane) and then get out of the way. Gump then describes a number of private operations that are dreaming, preparing, and even beginning to operate private space program components.

If only it were as easy as Gump—and we—would like it to be! But the history of the world's space programs tells me that success takes not a government hands-off but immense national determination, which is where the US falls far short of what is needed. If NASA had but half the national commitment enjoyed by the Defense or Energy Departments, what could it not do?

Fat chance, as they say. At least until the Soviets get far enough ahead in space to scare the socks off the generals. And Gump may not help things along with his breezy and over-optimistic description of what lies just around the futurist's ever more distant corner. Nor does he help when he commits such credibility-destroying gaffes as, "The researcher, Gerald Laver, has been working on an enzyme called neuraminidase that the flu virus needs to invade human cells. If neuraminidase can be neutralized, Laver could cure the common cold by preventing the virus from spreading in a human body." Dammit, the common cold is *not* flu!

ANADEMS

Fantasy Commentator #4 (Summer 1989) ($4 from A. Langley Searles, 48 Highland Circle, Bronxville, NY 10708-5909) has just landed on my desk, and it's worth mentioning for several items, including the ninth installment of Sam Moskowitz's history of SF, a piece on "Outer Space and C. S. Lewis" by Edward W. O'Brien, Jr., and Eric Leif Davin's interview with Frank K. Kelly.

Who is Kelly? He hit the pulps in 1931, at the grand old age of sixteen, with a series of remarkably bleak (for the time) tales. By 1935, he had cracked *Astounding*. And then he disappeared —or, rather, moved to other pastures, including journalism, speech-writing for Harry Truman, and founding the Center for the Study of Democratic Institutions in Santa Barbara, California. An interesting fellow, a forgotten piece of the history of the field, and well worth meeting via this interview. ■

●The chief danger in life is that you may take too many precautions.

Alfred Adler

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brass tacks

Dear Dr. Schmidt:

On page 84 of the June 1989 issue L. Sprague de Camp, in his excellent article "The Ape-Man Within Us," has, I believe, made a basic error in reasoning that understates the complexity of group dynamics. It is implicit in the article that getting along with each other is crucial, not least since we now have the capability to totally destroy ourselves and most of our fellow travelers on Spaceship Earth. Since I believe that a portion of de Camp's purpose in writing this article is to suggest to us how much of our (limited) resources we must devote to simply getting along with each other, I feel it is important to understand the magnitude of the required investment.

De Camp states, "The number of relationships goes up much faster than the number of people." Very true. And goes on to say in footnote 13, "If n is the number of people in a group and r the number of relationships among them, then:

$$r = \frac{n(n-1)}{2}$$

I infer from this equation that de Camp means to define relationship such that everyone in a group has some relationship with everyone else in the group no matter what the nature or intensity of the relationship. Using this definition of *relationship*, both de Camp and I would be talking about the actual number of relationships in the group, but the nature and intensity of the relationships would vary widely, such that two relationships would not have anything like similar impacts on group dynamics. (With a different definition of *relationship*, both de Camp and I would be talking about an upper limit on the possible number of relationships rather than the actual number of relationships.) All relationships are *not* equal.

The equation de Camp gives in footnote 13 counts only those relationships between two individual members of the group; it ignores relationships that include more than two individuals; it ignores the factionalism that *always* takes place in groups of humans. Thus, the actual number of relationships within a group is the sum of all possible relationships between two individuals of the group *plus* all possible relationships between any three individuals of the group *plus* all possible relationships between any four individuals of the group *plus*. . . . Furthermore, when attempting to calculate the number of relationships in the group, one must remember that a relationship of A and B against C is not the same as a relationship of A and C against B, and that both relationships can exist at the same time. Neither de Camp nor I ever said humans are truly rational.

At any rate, I believe it is clear that de Camp significantly understates the number of relationships within a group and, thus, understates the magnitude of the problem we face. Furthermore, if my thesis is correct, de Camp also significantly understates the rate at which the number of relationships in a group increases as the size of the group increases. Alas, I find I have failed to

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practice my undergraduate combinatorial mathematics enough in recent years to derive an equation to describe this increase, but I was able to convince myself that it is proportional to the third or fourth order of group size, rather than to the second as de Camp suggests.

JOSEPH F. HULL
1544 South Vaughn Circle
Aurora, CO 80012

The author replies. . . .

Dear Mr. Hull:

I think our differences are semantic. I used "relationship" in the broad sense of "co-membership." One can break down the relationship between A and B into sub-relationships, as those between husband and wife, where (as in my case) the wife is also collaborator, editor, business manager, best friend, co-parent, &c. Likewise these sub-relationships can differ and vary in intensity.

I used the broad definition because it is easily quantifiable, since one can count the people in the group. When one uses the term in a narrower sense, one quickly loses quantitative control. Now do you measure how intensely John loves Mary? And if he loves her 80% on the erotic scale today but only 70% yesterday, do you average them, or what? You see the difficulty. Subdividing and quantifying "relationship" is a fine idea, but a pop-science article would not be the place. A Ph.D. thesis, perhaps?

L. SPRAGUE DE CAMP

Dear Stan:

It seems as if sixties-bashing has become trendy these days, more's the pity. I was innocently enjoying L. Sprague de Camp's article *The Ape-Man Within Us*, essentially agreeing with his point of view, and noting that he has kept abreast of various contemporary points of view regarding anthropology, myth, and archetypes. All of a sudden he is labeling ". . . the great youth revolt of 1965-75 . . . the most irrational, self-destructive mass movement since the Peasants' Crusade of 1095." And he further links his opinion, unsubstantiated beyond an incident where some idiot(s) ". . . emptied a bucket of water over Wilson's (Edward O. Wilson) head," to anti-hereditarian fever.

I was in the center of the sixties movement and it was anything but irrational and/or self-destructive. In many respects, it was more of a renaissance; renaissance is defined as "a movement or period of vigorous artistic and intellectual activity; rebirth, revival." The sixties was the epitome of such activity.

It is sad to me that de Camp's obviously negative experience in this period of time leads him to generalize in such an egregiously inaccurate manner. While I am not a scientist and certainly do not agree with attacking all hereditarians as fascists and racists, as related by de Camp, I remember that some so-called scientists in bygone years attempted to utilize heredity as a prop for racist propaganda. Like de Camp, I view the human species as a race which acts from both hereditary and environmental influences. In the same way that not all hereditarians are fascists and racists because a few may be, neither did more than a very few, out of millions, participate or even share the view of those who trashed offices and records, bombed offices or dumped water buckets over peoples' heads. *However*, that does not mean that a tremendous number of us in those days *and the present* did/do not view the paths taken by alleged leaders to be essentially irrational, self-destructive and contra-survival, to use a few of de Camp's own words. And, for me the proof is in the pudding;

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although there was a great hue and cry on the part of young people in the sixties against environmental destruction, morally bankrupt wars, unnecessary and inefficient weaponry, racism, sexism and sleazoid politicians—what was the actual upshot? The power elite pulled the ropes real tight as regards information through the media, the shift of economic levers lessening leisure and think-things-out time, and its concomitant effect upon those who were able to live upon the fringe of society with very little money. And what is the result of action taken in reaction to the sixties? Our environment is besieged on all fronts and we are on the verge of possible disaster to the planet on any of a number of levels, the incredible drain of hard-earned dollars continues going to inefficient, unnecessary weaponry (SDI, MX, B-1, chemical weapon stockpiling, continued nuclear bomb testing, etc., ad nauseum), incredible waste, inefficiency, duplication and outright fraud running rampant throughout government and the entire bureaucratic structure, and the continued attempt by our country to impose its morally bankrupt will upon others . . . in the name of freedom and democracy. What blatant hypocrisy. We help to create and sustain the right-wing dictatorships via the misappropriation through taxes of our hard-earned wages, and then scream like a stuck pig when the people (with a little help from those who have their own agendas) rise up in revolution against same.

Mr. de Camp, with all due respect, I'll take the sixties *any* time; and, frankly, I miss the sense of excitement and aliveness that existed then, the sense of hope that we could really turn things around on the planet, make a difference; help to make it right for all individuals by providing a base, or foundation, by which any one could achieve their individual flowering or destiny. And, Mr. de Camp, though there were individuals who were sufficiently aberrated to distort the essentially loving nature of the sixties, that period of time manifested the best of what we hope to be as human beings: heart, soul and vision. I suggest that you read some of the books which deal with that time, and don't leave out "The Tao of Physics."

DON BARSHAY

Swarthmore, PA

The author replies. . . .

Dear Mr. Barshay:

My negative view of the Youth Revolt does not include all the causes embraced by some of the rebels. As a lifelong conservationist going back to the day of Theodore Roosevelt, for instance, I share your environmentalism. While for a time I thought the pluses of our Vietnamese War outweighed the minuses, I later decided it was a futile enterprise, because (as had been shown in Nicaragua and Afghanistan) no matter how good you think your system is, other people will not accept it if it is forced upon them by foreigners. Tribalistic xenophobia takes over.

More to the point, the excesses of activists of the Youth Revolt, such as throwing paper bags of shit at policemen during the 1968 Democratic Convention in Chicago, or the baptism of Professor Wilson, raised such intense antagonism among the rest of the population as to be a major factor in the following conservative reaction. This in turn caused the presidential election of a superstitious ignoramus and devout anti-conservationist, under whom the national motto could have been "Let greed reign unconfined!" But that is the price the country pays for the "excitement and aliveness" of the Youth Revolt.

L. SPRAGUE DE CAMP

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Dear Dr. Schmidt,

I agree that hypermedia offers great potential help in transmitting information among many people of widely varying professions, but the ability to view more information doesn't necessarily mean that better decisions will be made. Indeed much research in decision-making indicates that as people receive more information only their confidence significantly increases while the accuracy of their decisions does not significantly increase. Also many researchers have noted that people are quickly overwhelmed by information. Usually people make decisions based on rules of thumb that come close to optimal decision; Simon refers to this process as "Satisficing" the decisions are good enough.

Where I see hypermedia making a major impact is in the area of exchanging scientific research. Since the early 1900s the scientific journal has undergone little evolution. Most journals still rely on print and black & white two dimensional graphs to convey information. HyperJournals would allow researchers to view pictures that have been scanned and would allow researchers to view three dimensional graphs that could be rotated as can be done with MACSPIN.

Perhaps most importantly a HyperJournal could be extensively cross-referenced, simply by clicking on a referenced citation one could be in that article instantly! No more hassling with libraries or waiting for interlibrary loans. The format of the HyperArticle would allow a researcher to have an informational "zoom lens" allowing him to concentrate on specifics of the article that most interest him. Researchers would no longer be forced to "fit" their research into five pages. They could include valuable information such as diagrams of the equipment used, the actual code for any programs used and even the raw data so that any researcher could quickly and easily replicate the experiment or verify the conclusions drawn from the raw data.

Presently I am often frustrated in reading a journal article that lacks some detail of the procedure that I am interested in or sometimes I don't quite agree with the analyses that were performed but I have no idea what the raw data looked like. If we are going to integrate the myriad of scientific writing, then we will have to progress from technology that was created in the 1600s. Five pages of black and white text can only go so far.

MARK SHURTLEFF

Las Cruces, NM

Dear Editor,

Close, but no cigar (George is smoking it). The quote on page 191 of the July, 1989 issue is attributed to Fred Allen, but actually belongs to the much more appropriate (in my opinion) Gracie Allen. Enclosed is a photocopy from George Burns's *Gracie, A Love Story*, page 208.

A. ESTRIN

My source said Fred, and it's quite possible that they both *said it. But it* does *sound especially appropriate for Gracie. . . .* ■

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THE 1988 ANALYTICAL LABORATORY

From left to right: Ian Randal Strock, Tina Lee, Michael F. Flynn, Stanley Schmidt Amy Bechtel, William F. Battista.

Just in case you might have missed our July 1989 issue, here's a recap of all our winners:

"Sanctuary," *James White*—Best Novelette
"The Circus Horse," *Amy Bechtel*—Best Short Story
"An Introduction to Psychohistory," *Michael F. Flynn*—Best Fact Article
February: *Vincent Di Fate,* for *Falling Free*—Best Cover

The awards ceremony was held at the Grand Palace Restaurant in New York City's Chinatown on April 21, 1989, in conjunction with *Asimov's* Readers' Awards. Unfortunately, winners James White and Vincent Di Fate were unable to attend the festivities. The thirty guests were feted with a ten course banquet that included Peking Duck and Cantonese style lobster. The event was a wonderful prelude to the Nebula weekend.

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a calendar of analog upcoming events

16-18 February
BOSKONE XXVII (New England SF conference) at the Marriott and Sheraton Tara, Springfield, Mass. Guest of Honor—Glen Cook, Official Artist—David A. Cherry, Special Guest—Charles Ryan. Registration—$26 until 6 January 1990, $42 at the door. Info: Boskone XXVII, Box G, MIT Branch, Cambridge MA 02139-0910.

16-18 February
COSTUME CON 8 (SF/F costuming conference) at Red Lion Inn, Ontario, Calif. Registration—$30 until 1 February 1990, $40 at the door. Info: Costume Con 8, 3216 Villa Knolls Drive, Pasadena CA 91107.

17-19 February
ECLECTICON 4 (SF/fantasy conference) at Hilton Hotel, Sacramento, Calif. Guests of Honor—Poul and Karen Anderson, Fan Guest of Honor—Terry Terry, Artist Guest of Honor—Arlin Robins, TM—Bob Vardeman. Registration—$25 until 15 January 1990, $30 at the door. Info: Eclecticon 4, Box 1524, Sacramento CA 95812.

23-25 February
ARISIA (media-oriented SF conference) at Lafayette Hotel, Boston, Mass. Guest of Honor—Richard Bowker, Artist Guest of Honor—A.C. Farley. Registration—$25 until 31 December 1989, more at the door, if available. Attendance limited to 1500. Info: Arisia, Inc., Box 2334, Pittsfield MA 01202-2334.

28 February-4 March
Conference on the Fantastic Imagination and New Critical Theory at Texas A&M University, College, Texas. Sponsored by Department of Modern & Classical Languages, College of Liberal Arts, Texas A&M University and Cepheid Variable. Info: Brett Cooke, Dept of Classical & Modern Languages, Texas A&M University, College TX 77843. (409) 845-2198.

23-27 August
CONFICTION (48th World Science Fiction Convention) at Netherlands Congress Centre, The Hague, Netherlands. Guests of Honor—Joe Haldeman, Wolfgang Jeschke, Harry Harrison; Fan Guest of Honor—Andy Porter. Registration—$65 until 31 December 1989. Supporting—$28 until 31 December 1989. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition—the works. Join now and get to nominate and vote for the Hugo Awards and the John W. Campbell Award for Best New Writer. Info: Worldcon 1990, Box 95370, 2509 CJ The Hague, Netherlands. Enclose sufficient International Reply Coupons for airmail response.

30 August-3 September
CONDIEGO/NASFiC (North American SF Convention) at the San Diego Omni Hotel International, San Diego, Calif. Guest of Honor—Samuel R. Delany, Fan Guest of Honor—Ben Yalow. Registration—$65 until 1 January 1990, $75 thereafter, $85 at the door. Supporting membership—$25. Info: ConDiego, Box 15771, San Diego CA 92115.

—Anthony Lewis

Items for the Calendar should be sent to the Editorial Offices six months in advance of the event.

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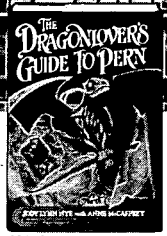

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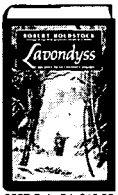

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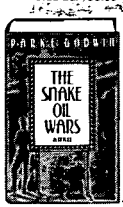

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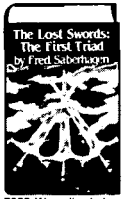

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